Drinking Water Surveillance Program

ODESSA WATER TREATMENT PLANT

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ODESSA
WATER TREATMENT PLANT

DRINKING WATER SURVEILLANCE PROGRAM

ANNUAL REPORT 1988

FEBRUARY 1990

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EXECUTIVE SUMMARY

DRINKING WATER SURVEILLANCE PROGRAM

ODESSA WATER TREATMENT PLANT
1988 ANNUAL REPORT

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. Currently, 52 plants are being monitored.

The Odessa Water Treatment Plant is a conventional treatment plant which treats water from Millhaven Creek. The process consists of coagulation, flocculation, sedimentation, filtration and disinfection. Carbon contactors are used for taste and odour removal. This plant has a design capacity of 2.046 x 1000 m^3/day and serves a population of approximately 900.

Samples from the raw and treated water at the plant and from one site in the distribution system were taken on a monthly basis beginning in February. Samples were analyzed for approximately 160 parameters. Parameters were divided into the following groups Bacteriological, Inorganic and Physical(Laboratory Chemistry, Field Chemistry and Metals) and Organics (Chloroaromatics, Chlorophenols, Pesticide and PCB, Phenolics, Polynuclear Aromatic Hydrocarbons, Specific Pesticides and Volatiles). Specific Pesticides and Chlorophenols were analysed in June and November only.

A summary of results is shown in Table 1.

Inorganic and Physical parameters (Laboratory Chemistry, Field Chemistry and Metals) were below any applicable health related ODWOs.

Of approximately 110 Organic parameters tested for on a monthly basis, none exceeded health related guidelines.

Effective treatment should be provided continuously to ensure safety and consistency in the quality of all waters. While the results for parameters measured on DWSP may not have exceeded drinking water guidelines, the water produced cannot be considered to be satisfactory.

TABLE 1

DRINKING WATER SURVEILLANCE PROGRAM ODESSA WTP

SUMMARY TABLE BY SCAN

SCAN	RAW			TREATED			SITE 1		
	TESTS	POSITIVE	%POSITIVE	TESTS	POSITIVE	%POSITIVE	TESTS	POSITIVE	%POSITIVE
BACTERIOLOGICAL	44	43	97	46	15	32	36	15	41
CHEMISTRY (FLD)	36	36	100	72	72	00	84	84	100
CHEMISTRY (LAB)	246	212	86	246	189	76	323	275	85
METALS	288	117	40	288	98	34	446	195	43
CHLOROAROMATICS	168	0	0	168	0	0	126	0	0
CHLOROPHENOLS	0	0	0	0	0	0	.	.	.
PAH	204	0	0	204	0	0	.	.	.
PESTICIDES & PCB	396	0	0	396	0	0	309	0	0
PHENOLICS	12	8	66	12	8	66	.	.	.
SPECIFIC PESTICIDES	13	0	0	13	0	0	0	0	0
VOLATILES	315	1	0	315	38	12	256	33	12
TOTAL	1722	417		1760	420		1580	602	

NO HEALTH RELATED GUIDELINES WERE EXCEEDED

A POSITIVE VALUE DENOTES THAT THE RESULT IS GREATER THAN THE STATISTICAL LIMIT OF DETECTION AND IS QUANTIFIABLE
A '.' INDICATES THAT NO SAMPLE WAS TAKEN

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INTRODUCTION

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. Currently, 52 plants are being monitored. Appendix A contains a detailed description of the DWSP.

The DWSP program was initiated at the Odessa Water Treatment Plant in February 1988.

This report contains information and results for 1988.

PLANT DESCRIPTION

The Odessa Water Treatment Plant is a conventional treatment plant which treats water from Millhaven Creek. The process consists of coagulation, flocculation, sedimentation, filtration and disinfection. Carbon contactors are used for taste and odour control. The carbon filters were changed in May 1988. The plant has

a design capacity of 2.046 x 1000 m^3/day and sample day flows ranging from 0.5 x 1000 m^3/day to 1.0 x 1000 m^3/day. This plant serves a population of approximately 900.

The plant location is shown in Figure 1. Plant Process details, in a block schematic, are shown in Figure 2. General plant information is presented in Table 2.

METHODS

Water samples were obtained from three DWSP approved locations;

i) Plant Raw - The water originated from the intake line before the lowlifts prior to addition of chemicals and was sampled through a stainless steel pump and line. The sample tap is located in the filter building.

ii) Plant Treated - The water originated from the highlift discharge after addition of all treatment chemicals and was sampled through a stainless steel line. The sample tap is located in the filter building.

iii) Distribution System - Site 1 - The distance of this house from the plant is unavailable. Water was sampled through copper plumbing from the basement laundry tap.

FIGURE 1

DRINKING WATER SURVEILLANCE PROGRAM

SITE LOCATION MAP

ODESSA WATER TREATMENT PLANT

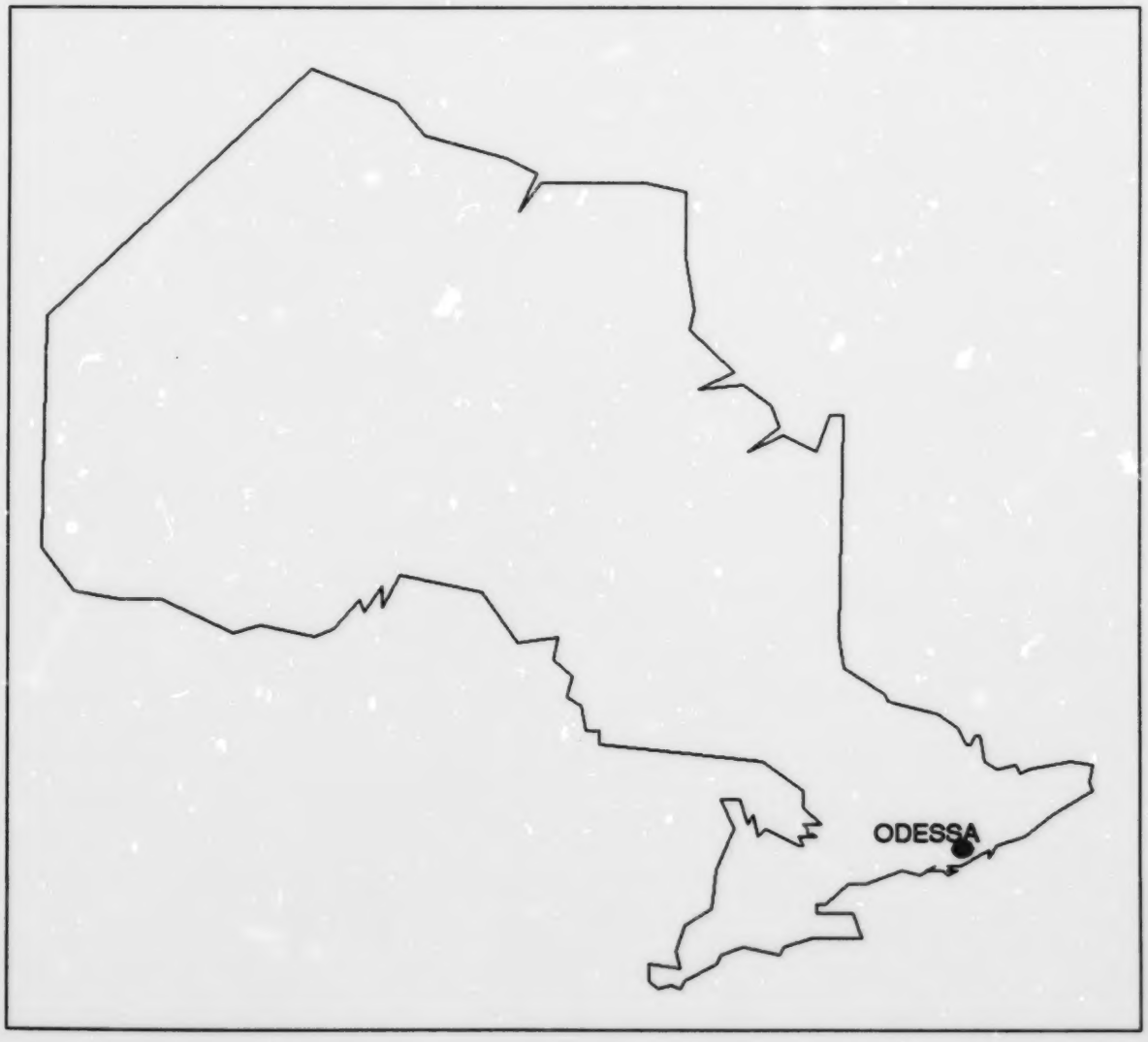

FIGURE 2

ODESSA WATER TREATMENT PLANT

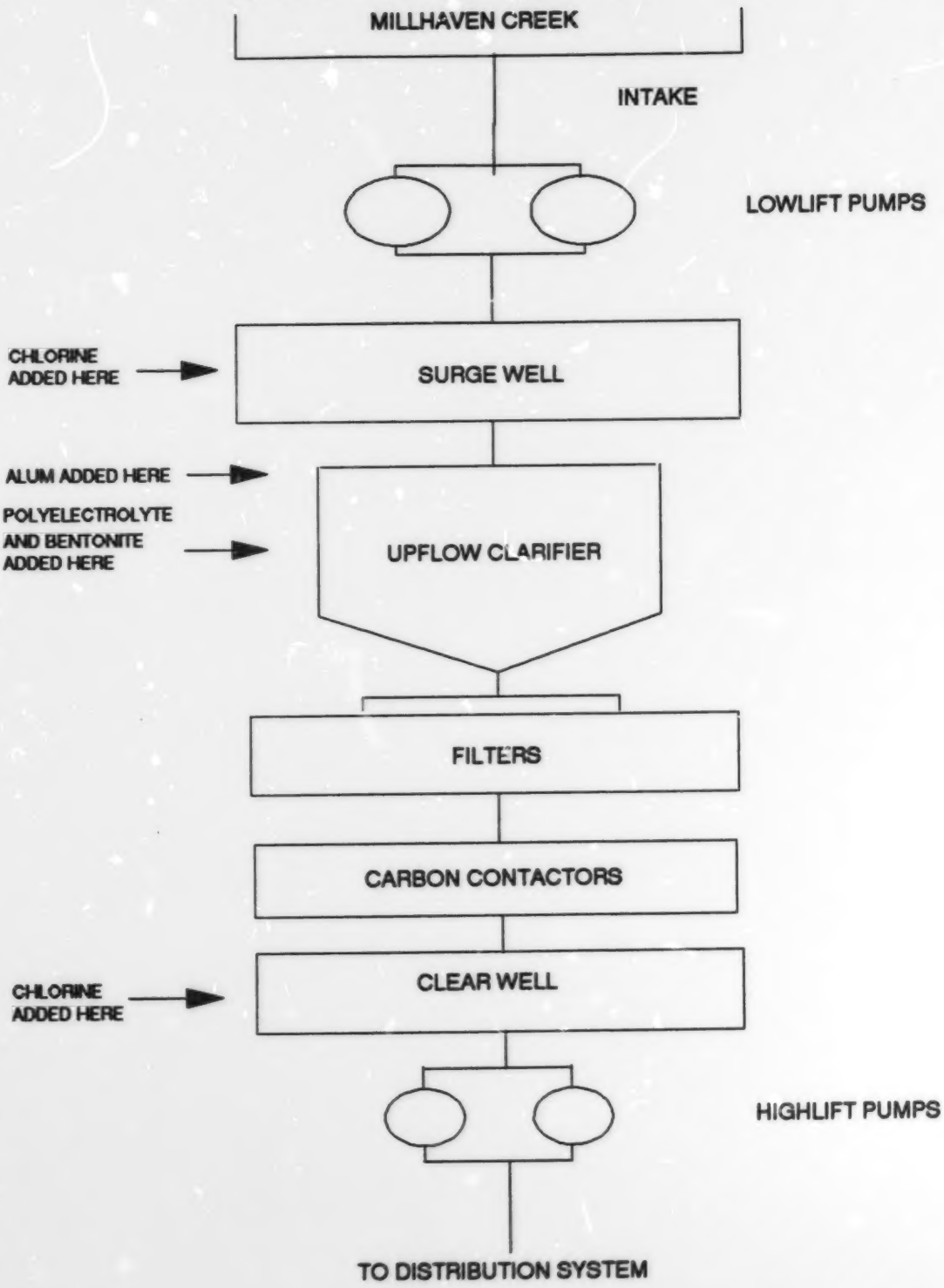

TABLE 2

DRINKING WATER SURVEILLANCE PROGRAM ANNUAL REPORT

GENERAL INFORMATION

ODESSA WATER TREATMENT PLANT

LOCATION:	C/O WPCP BRIDGE STREET PO BOX 100 ODESSA, ONTARIO K0H 2H0 (613-386-3066)
SOURCE:	RAW WATER SOURCE - MILLHAVEN CREEK
RATED CAPACITY:	2.046 (1000 M^3/DAY)
OPERATION:	MINISTRY
PLANT SUPERINTENDENT:	J. CROOK
MINISTRY REGION:	SOUTHEAST
DISTRICT OFFICER:	J. BISHOP

MUNICIPALITY SERVED	POPULATION
ODESSA	925

Sample lines in the plant were flushed prior to sampling to ensure that the water obtained was indicative of its origin and not residual water standing in the sample line.

At the distribution system location two types of samples were obtained: a standing and a free flow. The standing sample consisted of water that had been in the household plumbing andservice connection for a minimum of six hours. These samples are used to make an assessment of the amount by which the levels of inorganic compounds and metals may be changed on standing due to leaching from (or deposition on) the plumbing system. The only analyses carried out on the standing samples therefore, are General Chemistry and Metals. The free flow sample represented fresh water from the distribution main that had been flowing at the sample tap for five minutes before being sampled.

Attempts were made to capture the same block of water at each sampling point by taking the retention time into consideration. The retention time was calculated by dividing the volume of water between the two sampling points by the sample day flow. For example, if it was determined that the retention time within the plant was five hours then there would be a five hour interval between the raw and treated sample. Similarly if it was estimated that it took approximately one day for the water to travel from the

plant to the distribution system site, this site would be sampled one day after the treated water from the plant.

Stringent DWSP sampling protocols were followed to ensure that all samples were taken in a uniform manner (Appendix B).

Sample day flow, treatment chemical dosages and Field Chemistry measurements were recorded on the day of sampling and were entered on the DWSP database as submitted.

RESULTS

Water at the Odessa Water Treatment Plant and the distribution system Site was sampled monthly and analysed for approximately 160 parameters. The Specific Pesticides and Chlorophenols scans were sampled in June and November only. Polynuclear Aromatic Hydrocarbons and Phenolics were only analysed in the raw and treated water at the plant. As a result of an unforeseen emergency the laboratory capacity was exceeded and analysis for volatiles could not be carried out when the samples were received. Since analysis for volatiles is no longer valid after four weeks of storage, volatile results for February and March are not available.

Table 3 contains information on the sample day retention time, flow rate and treatment chemicals used and their associated dosages.

Table 4 is a summary break-down of the number of water samples

analysed by parameter and by water type. The number of times that a positive or trace result was detected is also reported.

Positive denotes that the result is greater than the statistical limit of detection established by the Ministry of the Environment (MOE) laboratory staff and is quantifiable. Trace (<T) denotes that the level measured is greater than the lowest value detectable by the method but lies so close to the detection limit that it cannot be confidently quantified.

Table 5 presents the results for parameters detected on at least one occasion.

Table 6 lists all parameters analysed in DWSP.

Associated guidelines and detection limits are also supplied on tables 5 and 6. Parameters are listed alphabetically within each scan.

DISCUSSION

General

Water quality is judged by comparison with the Ontario Drinking Water Objectives (ODWOs) as defined in the 1984 publication (ISBN 0-7743-8985-0). The Province of Ontario has health related and aesthetic objectives for 49 parameters, these are currently under

review. When an ODWO is not available guidelines/limits from other agencies are consulted. The Parameters Listing System (PALIS) recently published (ISBN 0-7729-4461-X) by the MOE catalogues and keeps current over 1750 guidelines for 650 parameters from agencies throughout the world.

Although some of the parameters measured on DWSP may be present in the raw and treated water as a result of pollution, many of the compounds detected are naturally occurring or are treatment by-products.

Plant operational personnel address occurrences of taste and odour or biological water quality parameters. The DWSP does not assess these aspects of the water supply.

As stated under Results, traces do not indicate quantifiable values, as defined by established MOE Laboratory analytical reporting protocols. While they can be useful in trend analysis or confirmation of the presence of a specific contaminant that is repeatedly detected at these levels, the occasional finding of a trace level of a contaminant is not considered to be significant. **DISCUSSION OF GUIDELINES AND LIMITS THEREFORE, IS ONLY CONDUCTED ON POSITIVE RESULTS.**

Bacteriology

Positive results for the Bacteriology scan were present fifteen

times in the treated water and the Site 1 water sample. The positive parameters were Standard Plate Count, Total coliform and/or Total Coliform Background.

Standard Plate Count is a test used to supplement routine analysis for Coliform bacteria. The limit for Standard Plate Count (at 35°C after 48 hours) in the ODWOs is 500 organisms per mL (based on a geometric mean of 5 or more samples). High Standard Plate Counts were present in the June and July treated water and the June, July and September Site 1 water. Total Coliforms were detected in the July Site 1 water sample. No samples contained bacteriological results over any applicable health related ODWOs.

The presence/absence (P.A.) test determined Coliform bacteria to be present within 48 hours in the April treated water sample.

Guidelines for bacteriological sampling and testing of a supply are developed to maintain a proper supervision of its bacteriological quality; the routine monitoring program usually requires the taking of multiple samples in a given system. Full interpretation of bacteriological quality cannot be made on the basis of single samples. Further, bacteriological limits were developed in acknowledgement that the presence of coliforms may be detected due to their non-uniform distribution throughout the distribution system and the fact that their enumeration is subject to considerable variation. For these reasons, the occasional

finding of low numbers of coliform organisms is not unexpected. Routine bacteriological monitoring, as outlined in the ODWOs is carried out by the operating authority.

Inorganic and Physical Parameters

Laboratory and Field Chemistry

The results for Laboratory and Field Chemistry scans were below any applicable health related ODWOs .

Colour values exceeded the aesthetic ODWO of 5 True Colour Units (TCU) fourteen times in treated water and Site 1 free flow water samples. Colour in drinking water may be due to the presence of natural or synthetic organic substances as well as certain metallic ions.

The ODWO recommend a hardness level of between 80 and 100 mg/L as calcium carbonate for domestic waters, to provide an acceptable balance between corrosion and incrustation. Water supplies with a hardness greater than 200 mg/L are considered poor and would possess a tendency to form scale deposits and result in excessive soap consumption.

The Odessa supply has hardness levels varying from 105 ug/L to 271 ug/L. The source at Odessa is Millhaven Creek, the watershed of which drains a limestone area; hardness components would thus

tend to be leached from the surrounding geological formations.

The Langelier Index is used extensively in estimating the corrosion potential of water. An increasingly negative index indicates the increasing possibility of corrosion. It is considered sound engineering practice to maintain a slightly positive Langelier Index. The Langelier Index for Odessa is positive with the exception of one negative value in the Site 1 free flow water and two in the standing water.

It is desirable that the Temperature of drinking water be less than 15°C; the palatability of water is enhanced by its coolness. A temperature below 15°C will tend to reduce the growth of nuisance organisms and hence minimize associated taste, colour, odour and corrosion problems. The temperature of the delivered water may increase in the distribution system due to the warming effect of the soil in late summer and fall and/or as a result of higher temperatures in the source water. The desired ODWO was exceeded nine times in the treated water and free flow distributed water.

Turbidity in water is caused by the presence of suspended matter such as clay, silt, colloidal particles, plankton and other microscopic organisms. The most important potential health effect of Turbidity is its interference with disinfection in the treatment plant and the maintenance of a chlorine residual. The ODWO of 1 Formazin Turbidity Unit (FTU) is only applicable to treated water

leaving the plant.

Metals

The results reported for the Metal scan were below any applicable health related ODWOs.

Levels of Copper, Nickel, Lead and Zinc were slightly elevated in the standing samples from the distribution system site as compared to the free flow samples thus, indicating that these metals were leached from the household plumbing as the water stood overnight. Although the Langelier Index indicates minimal potential for corrosion some metals will be leached in standing samples in most supplies.

At present, there is no evidence that Aluminum is physiologically harmful and no health limit for drinking water has been specified. The measure of residual Aluminum in the treated water is important to indicate the efficiency of the treatment process. The ODWOs indicate that a useful guideline is to maintain a residual below 100 ug/L as Al in the water leaving the plant to avoid problems in the distribution system. Aluminum values exceeded the ODWO operational guideline eight times in the treated water.

Alum dosages reported in Table 3 indicate that the coagulant was not added in June, July or September, the aluminum values from Table 5 support this. The plant had operational difficulties with

the clarifier. At that time the only available site for alum application was into the clarifier. For the months of June, July and September the plant was unable to operate as a conventional treatment plant and no coagulant was added.

Organic Parameters

Chloroaromatics

Results of the Chloroaromatics scan showed that none were detected.

Chlorophenols

Results of the Chlorophenol scan showed that no Chlorophenols were detected.

Pesticides and PCB (Polychlorinated Biphenyl)

Results of the Pesticides and PCB scan showed that no PCBs were detected and that one pesticide was detected:

Alpha BHC

There are several isomers of BHC (Benzene Hexachloride); gamma BHC is the active ingredient of the pesticide Lindane, while alpha BHC is the isomer predominantly found in surface waters in the Great Lakes basin as indicated in results from other water supplies on DWSP.

Alpha BHC was detected at trace levels, three times in the raw

water.

Phenolics

The maximum desirable concentration of phenolic substances in drinking water is 2.0 ug/L. This limit has been set primarily to prevent the occurrence of undesirable tastes and odours, particularly in chlorinated water. Phenolics were detected at levels ranging from 2.0 ug/L to 8.4 ug/L in the raw and treated water samples. Phenolics were detected at trace levels, twice in the raw water and once in the treated water. The limit was exceeded seven times but the effect on taste and odour is not known since this is not tested by the DWSP. Phenolic compounds are present in the aquatic environment as a result of natural and/or industrial processes.

Polynuclear Aromatic Hydrocarbons (PAH)

Results of the PAH scan showed that no PAHs were detected.

Volatiles

Results of the Volatile scan showed that six parameters, other than Trihalomethanes(THMs), were detected:

- Benzene
- Toluene
- Ethylbenzene
- Ortho-Xylene
- Styrene

Benzene was detected at a trace level, once in the treated water.

Toluene was detected at trace levels, once in the raw water, three times in the treated water and twice at Site 1. The detection of toluene at low, trace levels is a laboratory artifact derived from the analytical methodology. The purge-and-trap analytical technique depends on the purging of the volatile organics in the water sample with helium gas onto a Tenax trapping column. The volatile materials are subsequently thermally desorbed, separated and quantified. Tenax, a toluene-like polymeric material, tends to decompose sporadically upon heating into toluene and other aromatic componenets (ethylbenzene and xylene) giving instrument blanks in the order of 0.05 ug/L.

The detected trace levels of Styrene are also considered to be laboratory artifacts due to the outgassing of monomeric styrene from the polystyrene shipping containers. The sporadic background levels from this source are in the order of 0.05 ug/L.

Ethylbenzene was detected at trace levels, twice in the raw water, three times in the treated water and six times in the Site 1 water.

Ortho-Xylene (O-Xylene) was detected at trace levels, twice in the treated water and Site 1 water.

The volatiles listed above are typically found on an occasional

basis at other water supplies included on the DWSP usually at trace levels. Their occurrence in treated Odessa water followed activated carbon filtration.

Tetrachloroethylene (T-Chloroethylene) was detected at a trace level, once in a Site 1 water sample.

THMs are known to be produced during the water treatment process and will always occur in chlorinated surface waters. THMs are comprised of Chloroform, Chlorodibromomethane and Dichlorobromomethane. Bromoform occurs occasionally. Results are reported for the individual compounds as well as for total THMs.

Chloroform, Chlorodibromomethane, Dichlorobromomethane and Total THMs were detected in all treated waters. All Total THM occurrences, ranging from 4.95 ug/L to 231.9 ug/L were below the ODWO of 350 ug/L.

CONCLUSIONS

Generally, the Odessa Water Treatment Plant produced a good quality as assessed by measurement of the ODWOs. However as discussed, the coagulant was not added for several months.

Effective treatment should be provided continuously to ensure safety and consistency in the quality of all waters. The current

Ministry policy (#15-14-01) requires that all surface waters shall use treatment processes consisting of coagulation-flocculation, filtration (or equivalent) and disinfection.

RECOMMENDATIONS

One recommendation can be made:

1) Operational problems related to the addition of coagulant should be corrected and the reason for elevated Aluminum levels in treated water samples should be investigated.

TABLE 3

DRINKING WATER SURVEILLANCE PROGRAM ODESSA WTP SAMPLE DAY CONDITIONS FOR 1988

	SAMPLE DAY CONDITIONS		TREATMENT CHEMICAL DOSAGES (MG/L)				
DATE	RETENTION TIME(HRS)	FLOW (1000 M3)	PRE-CHLORINATION CHLORINE	COAGULATION ALUM LIQUID	COAGULATION AID BENTONITE	POLYELECTROLYTE	POST-CHLORINATION CHLORINE
FEB 24	.5	.6	2.00	12.00	.	.	.25
APR 06	2.0	.5	2.95	30.00	12.00	.40	.30
APR 26	2.5	.6	4.50	48.10	24.00	1.80	.57
MAY 11	2.0	.6	2.00	48.40	21.80	1.40	.27
MAY 25	2.0	.7	3.17	47.90	11.96	.72	.46
JUN 28	2.0	.7	4.70	.	.	.	.59
JUL 26	2.6	.7	1.06	.	.	.	4.24
AUG 23	3.0	.8	5.66	74.60	2.60	.39	1.10
SEP 27	2.0	.7	6.00	.	.	.	.75
OCT 25	.4	1.0	3.29	3.35	.52	.01	.47
NOV 28	4.0	.7	1.90	31.20	4.90	.20	2.60
DEC 21	5.0	.7	1.58	29.74	2.65	.24	2.96

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM ODESSA

SUMMARY TABLE OF RESULTS (1988)

SCAN	PARAMETER	RAW			TREATED			SITE 1		
		TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
BACTERIOLOGICAL	AEROMONAS SP	.	.	.	1	0	0	.	.	.
	E. COLI P/A	.	.	.	1	0	0	.	.	.
	FECAL COLIFORM MF	12	11	0	.	.	.	.	.	.
	FECAL COLIFORM	.	.	.	1	0	0	.	.	.
	STANDRD PLATE CNT MF	8	8	0	11	10	0	9	9	0
	P/A BOTTLE	.	.	.	8	1	0	7	0	0
	STAPH AUREUS	.	.	.	1	0	0	.	.	.
	COLIFORM	.	.	.	1	1	0	.	.	.
	TOTAL COLIFORM MF	12	12	0	11	0	0	10	1	0
	T COLIFORM BCKGRD MF	12	12	0	11	3	0	10	5	0
*TOTAL SCAN BACTERIOLOGICAL		44	43	0	46	15	0	36	15	0
*TOTAL GROUP BACTERIOLOGICAL		44	43	0	46	15	0	36	15	0
CHEMISTRY (FLD)	FLD CHLORINE (COMB)	.	.	.	12	12	0	11	11	0
	FLD CHLORINE FREE	.	.	.	12	12	0	18	18	0
	FLD CHLORINE (TOTAL)	.	.	.	12	12	0	19	19	0
	FLD PH	12	12	0	12	12	0	17	17	0
	FLD TEMPERATURE	12	12	0	12	12	0	19	19	0
	FLD TURBIDITY	12	12	0	12	12	0	.	.	.
*TOTAL SCAN CHEMISTRY (FLD)		36	36	0	72	72	0	84	84	0
CHEMISTRY (LAB)	ALKALINITY	12	12	0	12	12	0	18	18	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM ODESSA

SUMMARY TABLE OF RESULTS (1988)

SCAN	PARAMETER	RAW			TREATED			SITE 1		
		TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
CHEMISTRY (LAB)	CALCIUM	12	12	0	12	12	0	19	19	0
	CYANIDE	12	1	0	12	1	1	10	0	0
	CHLORIDE	12	12	0	12	12	0	19	19	0
	COLOUR	12	12	0	12	10	2	18	16	2
	CONDUCTIVITY	12	12	0	12	12	0	18	18	0
	FLUORIDE	12	12	0	12	11	1	17	17	0
	HARDNESS	12	12	0	12	12	0	19	19	0
	IONCAL	12	6	0	12	6	0	19	10	0
	LANGELIERS INDEX	12	12	0	12	12	0	15	15	0
	MAGNESIUM	12	12	0	12	12	0	19	19	0
	SODIUM	12	12	0	12	12	0	19	19	0
	AMMONIUM TOTAL	12	12	0	12	11	1	17	17	0
	NITRITE	12	9	3	12	2	10	17	2	15
	TOTAL NITRATES	12	6	5	12	3	8	17	5	11
	NITROGEN TOT KJELD	12	12	0	12	12	0	17	17	0
	PH	12	12	0	12	12	0	18	18	0
	PHOSPHORUS FIL REACT	12	5	6	12	1	11	.	.	.
	PHOSPHORUS TOTAL	12	11	1	12	6	5	.	.	.
	SULPHATE	6	6	0	6	6	0	10	10	0
	TURBIDITY	12	12	0	12	12	0	17	17	0
*TOTAL SCAN CHEMISTRY (LAB)		246	212	15	246	189	39	323	275	28
METALS	SILVER	12	0	3	12	0	4	19	0	6

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM ODESSA

SUMMARY TABLE OF RESULTS (1988)

SCAN	PARAMETER	RAW			TREATED			SITE 1		
		TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
METALS	ALUMINUM	12	12	0	12	12	0	19	19	0
	ARSENIC	12	0	10	12	1	9	19	1	14
	BARIUM	12	12	0	12	12	0	19	19	0
	BORON	12	10	2	12	9	3	19	13	6
	BERYLLIUM	12	0	6	12	0	7	19	0	12
	CADMIUM	12	0	1	12	0	0	19	0	4
	COBALT	12	1	11	12	1	11	19	0	19
	CHROMIUM	12	3	8	12	4	7	19	2	14
	COPPER	12	1	11	12	1	11	19	19	0
	IRON	12	8	4	12	1	9	19	2	15
	MERCURY	12	2	6	12	0	6	9	0	0
	MANGANESE	12	12	0	12	12	0	19	19	0
	MOLYBDENUM	12	0	11	12	0	10	19	0	19
	NICKEL	12	0	5	12	1	4	19	8	7
	LEAD	12	11	1	12	4	8	19	19	0
	ANTIMONY	12	5	7	12	4	8	19	8	11
	SELENIUM	12	0	8	12	0	10	19	0	17
	STRONTIUM	12	12	0	12	12	0	19	19	0
	TITANIUM	12	12	0	12	12	0	19	19	0
	THALLIUM	12	0	2	12	0	2	19	0	3
	URANIUM	12	0	10	12	0	11	19	1	12
	VANADIUM	12	4	8	12	3	9	19	8	11
	ZINC	12	12	0	12	9	3	19	19	0
*TOTAL SCAN METALS		288	117	114	288	98	132	446	195	170
*TOTAL GROUP INORGANIC & PHYSICAL		570	365	129	606	359	171	853	554	198

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM ODESSA

SUMMARY TABLE OF RESULTS (1988)

SCAN	PARAMETER	RAW			TREATED			SITE 1		
		TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
CHLOROAROMATICS	HEXACHLOROBUTADIENE	12	0	0	12	0	0	9	0	0
	123 TRICHLOROBENZENE	12	0	0	12	0	0	9	0	0
	1234 T-CHLOROBENZENE	12	0	0	12	0	0	9	0	0
	1235 T-CHLOROBENZENE	12	0	0	12	0	0	9	0	0
	124 TRICHLOROBENZENE	12	0	0	12	0	0	9	0	0
	1245 T-CHLOROBENZENE	12	0	0	12	0	0	9	0	0
	135 TRICHLOROBENZENE	12	0	0	12	0	0	9	0	0
	HCB	12	0	0	12	0	0	9	0	0
	HEXACHLOROETHANE	12	0	0	12	0	0	9	0	0
	OCTACHLOROSTYRENE	12	0	0	12	0	0	9	0	0
	PENTACHLOROBENZENE	12	0	0	12	0	0	9	0	0
	236 TRICHLOROTOLUENE	12	0	0	12	0	0	9	0	0
	245 TRICHLOROTOLUENE	12	0	0	12	0	0	9	0	0
	26A TRICHLOROTOLUENE	12	0	0	12	0	0	9	0	0
*TOTAL SCAN CHLOROAROMATICS		168	0	0	168	0	0	126	0	0
CHLOROPHENOLS	234 TRICHLOROPHENOL	0	0	0	0	0	0	.	.	.
	2345 T-CHLOROPHENOL	0	0	0	0	0	0	.	.	.
	2356 T-CHLOROPHENOL	0	0	0	0	0	0	.	.	.
	245-TRICHLOROPHENOL	0	0	0	0	0	0	.	.	.
	246-TRICHLOROPHENOL	0	0	0	0	0	0	.	.	.
	PENTACHLOROPHENOL	0	0	0	0	0	0	.	.	.
*TOTAL SCAN CHLOROPHENOLS		0	0	0	0	0	0	0	0	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM ODESSA

SUMMARY TABLE OF RESULTS (1988)

		RAW			TREATED			SITE 1		
SCAN	PARAMETER	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
PAH	PHENANTHRENE	12	0	0	12	0	0	.	.	.
	ANTHRACENE	12	0	0	12	0	0	.	.	.
	FLUORANTHENE	12	0	0	12	0	0	.	.	.
	PYRENE	12	0	0	12	0	0	.	.	.
	BENZO(A)ANTHRACENE	12	0	0	12	0	0	.	.	.
	CHRYSENE	12	0	0	12	0	0	.	.	.
	DIMETH. BENZ(A)ANTHR	12	0	0	12	0	0	.	.	.
	BENZO(E) PYRENE	12	0	0	12	0	0	.	.	.
	BENZO(J) FLUORANTHEN	0	0	0	0	0	0	.	.	.
	BENZO(B) FLUORANTHEN	12	0	0	12	0	0	.	.	.
	PERYLENE	12	0	0	12	0	0	.	.	.
	BENZO(K) FLUORANTHEN	12	0	0	12	0	0	.	.	.
	BENZO(A) PYRENE	12	0	0	12	0	0	.	.	.
	BENZO(G,H,I) PERYLEN	12	0	0	12	0	0	.	.	.
	DIBENZO(A,H) ANTHRAC	12	0	0	12	0	0	.	.	.
	INDENO(1,2,3-C,D) PY	12	0	0	12	0	0	.	.	.
	BENZO(B) CHRYSENE	12	0	0	12	0	0	.	.	.
	ANTHANTHRENE	0	0	0	0	0	0	.	.	.
	CORONENE	12	0	0	12	0	0	.	.	.
*TOTAL SCAN PAH		204	0	0	204	0	0	0	0	0
PESTICIDES & PCB	ALDRIN	12	0	0	12	0	0	9	0	0
	ALPHA BHC	12	0	3	12	0	0	9	0	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM ODESSA

SUMMARY TABLE OF RESULTS (1988)

SCAN	PARAMETER	RAW			TREATED			SITE 1		
		TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
PESTICIDES & PCB	BETA BHC	12	0	0	12	0	0	9	0	0
	LINDANE	12	0	0	12	0	0	9	0	0
	ALPHA CHLORDANE	12	0	0	12	0	0	9	0	0
	GAMMA CHLORDANE	12	0	0	12	0	0	9	0	0
	DIELDRIN	12	0	0	12	0	0	9	0	0
	METHOXYCHLOR	12	0	0	12	0	0	9	0	0
	ENDOSULFAN 1	12	0	0	12	0	0	9	0	0
	ENDOSULFAN II	12	0	0	12	0	0	9	0	0
	ENDRIN	12	0	0	12	0	0	9	0	0
	ENDOSULFAN SULPHATE	12	0	0	12	0	0	9	0	0
	HEPTACHLOR EPOXIDE	12	0	0	12	0	0	9	0	0
	HEPTACHLOR	12	0	0	12	0	0	9	0	0
	MIREX	12	0	0	12	0	0	9	0	0
	OXYCHLORDANE	12	0	0	12	0	0	9	0	0
	OPDDT	12	0	0	12	0	0	9	0	0
	PCB	12	0	0	12	0	0	9	0	0
	DDD	12	0	0	12	0	0	9	0	0
	PPDDE	12	0	0	12	0	0	9	0	0
	PPDDT	12	0	0	12	0	0	9	0	0
	AMETRINE	12	0	0	12	0	0	10	0	0
	ATRAZINE	12	0	0	12	0	0	10	0	0
	ATRATONE	12	0	0	12	0	0	10	0	0
	CYANAZINE	12	0	0	12	0	0	10	0	0
	DES ETHYL ATRAZINE	6	0	0	6	0	0	5	0	0
	DES ETHYL SIMAZINE	6	0	0	6	0	0	5	0	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM ODESSA

SUMMARY TABLE OF RESULTS (1988)

SCAN	PARAMETER	RAW			TREATED			SITE 1		
		TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
PESTICIDES & PCB	PROMETONE	12	0	0	12	0	0	10	0	0
	PROPAZINE	12	0	0	12	0	0	10	0	0
	PROMETRYNE	12	0	0	12	0	0	10	0	0
	METRIBUZIN	12	0	0	12	0	0	10	0	0
	SIMAZINE	12	0	0	12	0	0	10	0	0
	ALACHLOR	12	0	0	12	0	0	10	0	0
	METOLACHLOR	12	0	0	12	0	0	10	0	0
*TOTAL SCAN PESTICIDES & PCB		396	0	3	396	0	0	309	0	0
PHENOLICS	PHENOLICS	12	8	2	12	8	1	.	.	.
*TOTAL SCAN PHENOLICS		12	8	2	12	8	1	0	0	0
SPECIFIC PESTICIDES	TOXAPHENE	1	0	0	1	0	0	0	0	0
	2,4,5-T	0	0	0	0	0	0	.	.	.
	2,4-D	0	0	0	0	0	0	.	.	.
	24DCHLRPHENOXYBUTYRC	0	0	0	0	0	0	.	.	.
	2,4 D PROPIONIC ACID	0	0	0	0	0	0	.	.	.
	DICAMBA	0	0	0	0	0	0	.	.	.
	PICHLORAM	0	0	0	0	0	0	.	.	.
	SILVEX	0	0	0	0	0	0	.	.	.
	DIAZINON	1	0	0	1	0	0	.	.	.

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM ODESSA

SUMMARY TABLE OF RESULTS (1988)

SCAN	PARAMETER	RAW			TREATED			SITE 1		
		TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
SPECIFIC PESTICIDES	DICHLOROVOS	1	0	0	1	0	0	.	.	.
	CHLORPYRIFOS	1	0	0	1	0	0	.	.	.
	ETHION	1	0	0	1	0	0	.	.	.
	AZINPHOS-METHYL	0	0	0	0	0	0	.	.	.
	MALATHION	1	0	0	1	0	0	.	.	.
	MEVINPHOS	1	0	0	1	0	0	.	.	.
	METHYL PARATHION	1	0	0	1	0	0	.	.	.
	METHYLTRITHION	1	0	0	1	0	0	.	.	.
	PARATHION	1	0	0	1	0	0	.	.	.
	PHORATE	1	0	0	1	0	0	.	.	.
	RELDAN	1	0	0	1	0	0	.	.	.
	RONNEL	1	0	0	1	0	0	.	.	.
	AMINOCARB	0	0	0	0	0	0	.	.	.
	BENOMYL	0	0	0	0	0	0	.	.	.
	BUX	0	0	0	0	0	0	.	.	.
	CARBOFURAN	0	0	0	0	0	0	.	.	.
	CICP	0	0	0	0	0	0	.	.	.
	DIALLATE	0	0	0	0	0	0	.	.	.
	EPTAM	0	0	0	0	0	0	.	.	.
	IPC	0	0	0	0	0	0	.	.	.
	PROPOXUR	0	0	0	0	0	0	.	.	.
	CARBARYL	0	0	0	0	0	0	.	.	.
	BUTYLATE	0	0	0	0	0	0	.	.	.
*TOTAL SCAN SPECIFIC PESTICIDES		13	0	0	13	0	0	0	0	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM ODESSA

SUMMARY TABLE OF RESULTS (1988)

SCAN	PARAMETER	RAW			TREATED			SITE 1		
		TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
VOLATILES	BENZENE	11	0	0	11	0	1	9	0	0
	TOLUENE	11	0	1	11	0	3	9	0	2
	ETHYLBENZENE	11	0	2	11	0	3	9	0	6
	P-XYLENE	11	0	0	11	0	0	9	0	0
	M-XYLENE	11	0	0	11	0	0	9	0	0
	O-XYLENE	11	0	0	11	0	2	9	0	2
	STYRENE	3	0	1	3	0	2	2	0	2
	1,1 DICHLOROETHYLENE	11	0	0	11	0	0	9	0	0
	METHYLENE CHLORIDE	11	0	0	11	0	0	9	0	0
	T1,2DICHLOROETHYLENE	11	0	0	11	0	0	9	0	0
	1,1 DICHLOROETHANE	11	0	0	11	0	0	9	0	0
	CHLOROFORM	11	1	3	11	11	0	9	9	0
	111, TRICHLOROETHANE	11	0	0	11	0	0	9	0	0
	1,2 DICHLOROETHANE	11	0	0	11	0	0	9	0	0
	CARBON TETRACHLORIDE	11	0	0	11	0	0	9	0	0
	1,2 DICHLOROPROPANE	11	0	0	11	0	0	9	0	0
	TRICHLOROETHYLENE	11	0	0	11	0	0	9	0	0
	DICHLOROBROMOMETHANE	11	0	1	11	10	1	9	9	0
	112 TRICHLOROETHANE	11	0	0	11	0	0	8	0	0
	CHLORODIBROMOMETHANE	11	0	0	11	7	4	9	6	3
	T-CHLOROETHYLENE	11	0	0	11	0	0	9	0	1
	BROMOFORM	11	0	0	11	0	0	9	0	0
	1122 T-CHLOROETHANE	11	0	0	11	0	0	9	0	0
	CHLOROBENZENE	11	0	0	11	0	0	9	0	0
	1,4 DICHLOROBENZENE	11	0	0	11	0	0	9	0	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM ODESSA

SUMMARY TABLE OF RESULTS (1988)

SCAN	PARAMETER	RAW			TREATED			SITE 1		
		TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
VOLATILES	1,3 DICHLOROBENZENE	11	0	0	11	0	0	9	0	0
	1,2 DICHLOROBENZENE	11	0	0	11	0	0	9	0	0
	TRIFLUOROCHLOROTOLUE	4	0	0	4	0	0	3	0	0
	ETHLYENE DIBROMIDE	11	0	0	11	0	0	9	0	0
	TOTL TRIHALOMETHANES	11	0	1	11	10	1	9	9	0
*TOTAL SCAN VOLATILES		315	1	9	315	38	17	256	33	16
*TOTAL GROUP ORGANIC		1108	9	14	1108	46	18	691	33	16
TOTAL		1722	417	143	1760	420	189	1580	602	214

KEY TO TABLE 5 and 6

A ONTARIO DRINKING WATER OBJECTIVES (ODWO)
1. Maximum Acceptable Concentration (MAC)
1+. MAC for Total Trihalomethanes
1*. MAC for Bacteriological Analyses
Poor water quality is indicated when :
- total coliform counts > 0 < 5
- P/A Bottle Test is present after 48 hours
- Aeromonas organisms are detected in more than 25% of samples in a single submission or in successive submissions from the same sampling site
- Pseudomonas Aeruginosa, Staphylococcus Aureus and members of the Fecal Streptococcus group should not be detected in any sample
- Standard Plate Count should not exceed 500 organisms per ml at 35 ^{0}C within 48 hours

2. Interim Maximum Acceptable Concentration (IMAC)
3. Maximum Desirable Concentration (MDC)
4. Aesthetic or Recommended Operational Guideline
- hardness levels between 80 and 100 mg/L as calcium carbonate are considered to provide an acceptable balance between corrosion and incrustation, water supplies with a hardness >200 mg/L are considered poor and those in excess of 500 mg/L are unacceptable.

B HEALTH & WELFARE CANADA (H&W)
1. Maximum Acceptable Concentration (MAC)
2. Proposed MAC
3. Interim MAC
4. Aesthetic Objective (AO) (for xylenes, the AO is a total)

C WORLD HEALTH ORGANIZATION (WHO)
1. Guideline Value (GV)
2. Tentative GV
3. Aesthetic GV

D US ENVIRONMENTAL PROTECTION AGENCY (EPA)
1. Maximum Contaminant Level (MCL)
2. Suggested No-Adverse Effect Level (SNAEL)
3. Lifetime Health Advisory
4. EPA Ambient Water Quality Criteria

F EUROPEAN ECONOMIC COMMUNITY (EEC)
1. Health Related Guideline Level
2. Aesthetic Guideline Level
3. Maximum Admissable Concentration (MADC)

G CALIFORNIA STATE DEPARTMENT OF HEALTH-GUIDELINE VALUE

H USSR MAXIMUM PERMISSIBLE CONCENTRATION

I NEW YORK STATE AMBIENT WATER GUIDELINE

N/A NONE AVAILABLE

INTERPRETATION OF DATA

The interpretation of analytical results that are obtained from measurements near the limit of detection of the measurement process is subject to greater uncertainty than those at higher concentrations. The principle areas of concern relate to whether the substance has actually been detected, whether it has been properly identified, and whether it is an artifact of the measurement process. In other words, false positives can be caused by the instrumentation or the test procedures used, when in fact these compounds are not present in the sample.

There are several methods to treat data from such measurements:
1. Exclude the low-level data because of this uncertainty factor. However, studies of long-term environmental trends and modelling may be adversely affected by exclusion of such data.
2. Qualify these data so the user is aware of the greater uncertainty associated with their use.

For the Drinking Water Surveillance Program, measurements near the limit of detection of the measurement process are reported qualified by the code "<T". Results quantified by "W" indicate a zero measurement. These results are reported for purposes of modelling and long-term trend analysis and no significance should be attributed to a single determination of a substance below "T" (a single determination may well be a false positive). Repeat analysis or additional data are needed before it can be stated with certainty that the substance in question was truly present. On the other hand, it is less likely that repeated detection of a substance at or near the limit of detection at a specific location is solely due to an artifact in the measurement system, and more likely represents a true positive. However the average of such data is still only an estimate of the amount of substance present subject to the possible biases of the method used.

LABORATORY RESULTS, REMARK DESCRIPTIONS

.	No Sample Taken
BDL	Below Minimum Measurable Amount
<T	Greater Than Detection Limit But Not Confident (SEE INTERPRETATION OF RESULTS ABOVE)
>	Results Are Greater Than The Upper Limit
<=>	Approximate Result
!AW	No Data: Analysis Withdrawn
!CR	No Data: Could Not Confirm By Reanalysis
!CS	No Data: Contamination Suspected
!IL	No Data: Sample Incorrectly Labelled
!IS	No Data: Insufficient Sample
!LA	No Data: Laboratory Accident

!LD	No Data: Test Queued After Sample Discarded
!NA	No Data: No Authorization To Perform Reanalysis
!NP	No Data: No Procedure
!NR	No Data: Sample Not Received
!OP	No Data: Obscured Plate
!QU	No Data: Quality Control Unacceptable
!PE	No Data: Procedural Error - Sample Discarded
!PH	No Data: Sample pH Outside Valid Range
!RE	No Data: Received Empty
!RO	No Data: See Attached Report (no numeric results)
!SM	No Data: Sample Missing
!SS	No Data: Send Separate Sample Properly Preserved
!UI	No Data: Indeterminant Interference
!TX	No Data: Time Expired
A3C	Approximate, Total Count Exceeded 300 Colonies
APL	Additional Peak, Large, Not Priority Pollutant
APS	Additional Peak, Less Than, Not Priority Pollutant
CIC	Possible Contamination, Improper Cap
CRO	Calculated Result Only
PPS	Test Performed On Preserved Sample
RMP	P and M-Xylene Not Separated
RRV	Rerun Verification
RVU	Reported Value Unusual
SPS	Several Peaks, Small, Not Priority Pollutant
UAL	Unreliable: Sample Age Exceeds Normal Limit
UCR	Unreliable: Could Not Confirm By Reanalysis
UCS	Unreliable: Contamination Suspected
UIN	Unreliable: Indeterminant Interference
XP	Positive After X Number of Hours
T# (T06)	Result Taken After # Hours

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ODESSA WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
BACTERIOLOGICAL				
AEROMONAS SP ( )			DET'N LIMIT = N/A	GUIDELINE = 0 (A1)
APR	.	0	.	.
E. COLI P/A ( )			DET'N LIMIT = N/A	GUIDELINE = N/A
APR	.	0	.	.
FECAL COLIFORM MF (CT/100ML)			DET'N LIMIT = 0	GUIDELINE = 0 (A1)
FEB	2	.	.	.
APR	1	.	.	.
	1	.	.	.
MAY	19	.	.	.
	14	.	.	.
JUN	3	.	.	.
JUL	4	.	.	.
AUG	BDL	.	.	.
SEP	3 T48	.	.	.
OCT	22 T48	.	.	.
NOV	4 T48	.	.	.
DEC	4	.	.	.
FECAL COLIFORM ( )			DET'N LIMIT = N/A	GUIDELINE = 0 (A1)
APR	.	0	.	.
STANDRD PLATE CNT MF (CT/ML)			DET'N LIMIT = 0	GUIDELINE = 500/ML (A1)
FEB	620	13	.	8
APR	780	12	.	TAW
	1300	28	.	1
MAY	860	3	.	2
	2400 >	44	.	.
JUN	2400 >	1200	.	2400 >
JUL	14000	2400 >	.	2400 >
AUG	1600	4	.	1
SEP	.	17 T48	.	24000 >
OCT	.	56 T48	.	490 T24
NOV	.	4 <=>	.	.
DEC	.	.	.	11 T48
P/A BOTTLE ( )			DET'N LIMIT = 0	GUIDELINE = 0 (A1*)
FEB	.	0	.	0
APR	.	0	.	0

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ODESSA WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
APR	.	1	.	0
MAY	.	0	.	0
	.	0	.	.
JUN	.	0	.	0
JUL	.	0	.	0
AUG	.	0	.	0
STAPH AUREUS ( )		DET'N LIMIT = N/A		GUIDELINE = 0 (A1)
APR	.	0	.	.
COLIFORM ( )		DET'N LIMIT = N/A		GUIDELINE = 0 (A1)
APR	.	1	.	.
TOTAL COLIFORM MF (CT/100ML)		DET'N LIMIT = 0		GUIDELINE = 5/100ML(A1)
FEB	1500	0	.	0
APR	1300	0	.	0
	2100	0	.	0
MAY	42 A3C	0	.	0
	1200	0	.	.
JUN	6 A3C	0	.	0
JUL	100 A3C	0	.	2 A3C
AUG	14	0	.	0
SEP	600 A3C	0 T48	.	0 A3C
OCT	1240 A3C	0 T48	.	0 T24
NOV	900 A3C	0 T48	.	.
DEC	560	.	.	0 T48
T COLIFORM BCKGRD MF (CT/100ML)		DET'N LIMIT = 0		GUIDELINE = N/A
FEB	1600	0	.	0
APR	4100	0	.	0
	16000	0	.	0
MAY	2400	0	.	2
	7600	0	.	.
JUN	4800 >	2400 >	.	33
JUL	12000	0	.	1800
AUG	1400	2	.	0
SEP	40000 A3C	0 T48	.	2400 >
OCT	48000 >	0 T48	.	100 T24
NOV	15000 A3C	2 T48	.	.
DEC	2460	.	.	0 T48

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ODESSA WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
CHEMISTRY (FLD)				
FLD CHLORINE (COMB) ( )		DET'N LIMIT = N/A		GUIDELINE = N/A
FEB	.	1.000	.	1.100
APR	.	.300	.200	.200
	.	.200	.	.200
MAY	.	.400	.	.
	.	.200	.	.
JUN	.	.600	.	.300
JUL	.	.400	.200	.200
AUG	.	.500	.	.
SEP	.	.300	.200	.200
OCT	.	.500	.	.300
NOV	.	.400	.	.
DEC	.	.600	.	.600
FLD CHLORINE FREE ( )		DET'N LIMIT = N/A		GUIDELINE = N/A
FEB	.	.100	.	.
APR	.	.300	.100	.100
	.	.500	.100	.100
MAY	.	.500	.100	.900
	.	.200	.	.
JUN	.	.400	.100	.100
JUL	.	.700	.100	.100
AUG	.	.700	1.900	1.900
SEP	.	.800	.100	.300
OCT	.	1.000	.100	.100
NOV	.	1.500	.	.
DEC	.	.700	.100	.300
FLD CHLORINE (TOTAL) ( )		DET'N LIMIT = N/A		GUIDELINE = N/A
FEB	.	1.100	.	1.100
APR	.	.600	.300	.300
	.	.700	.100	.300
MAY	.	.900	.100	.900
	.	.400	.	.
JUN	.	1.000	.100	.200
JUL	.	1.100	.300	.300
AUG	.	1.200	1.900	1.900
SEP	.	1.100	.300	.500
OCT	.	1.500	.100	.400
NOV	.	1.900	.	.
DEC	.	1.300	.100	.900
FLD PH (DIMNSLESS)		DET'N LIMIT = N/A		GUIDELINE = 6.5-8.5(A4)

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ODESSA WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
FEB	7.300	7.300	.	7.300
APR	7.600	7.300	.	.
	7.800	7.300	7.600	7.400
MAY	7.500	7.100	7.200	7.000
	7.500	7.100	.	.
JUN	7.500	7.500	7.600	7.600
JUL	7.800	7.500	7.600	7.600
AUG	8.100	7.300	7.400	7.200
SEP	8.200	7.500	7.600	7.600
OCT	7.400	7.000	7.400	7.200
NOV	7.500	7.100	.	.
DEC	7.500	7.300	7.200	7.000
FLD TEMPERATURE (DEG.C)			DET'N LIMIT = N/A	GUIDELINE = 15 (A1)
FEB	1.000	1.500	.	2.000
APR	8.500	8.000	14.000	6.000
	8.000	9.000	11.000	7.000
MAY	21.000	21.000	18.000	14.000
	15.000	17.500	.	.
JUN	19.000	20.000	19.000	18.000
JUL	20.000	24.000	22.000	21.000
AUG	21.000	21.000	20.000	20.000
SEP	18.000	18.000	20.000	12.000
OCT	9.500	9.000	17.000	12.000
NOV	.600	.700	.	.
DEC	1.000	2.000	19.000	5.000
FLD TURBIDITY (FTU)			DET'N LIMIT = N/A	GUIDELINE = 1.0 (A1)
FEB	.650	.950	.	.
APR	.700	.900	.	.
	1.200	.580	.	.
MAY	1.500	.730	.	.
	2.100	.720	.	.
JUN	.850	.700	.	.
JUL	1.100	.650	.	.
AUG	.920	.670	.	.
SEP	.900	.600	.	.
OCT	1.200	1.000	.	.
NOV	.900	.300	.	.
DEC	.800	.600	.	.

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ODESSA WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
CHEMISTRY (LAB)				
ALKALINITY (MG/L)			DET'N LIMIT = .200	GUIDELINE = 30-500 (A4)
FEB	172.000	167.700	.	167.000
APR	129.400	114.900	115.700	114.600
	151.600	149.700	115	139.400
MAY	133.900	101.500	100.700	114.700
	155.100	134.400	.	.
JUN	103.900	95.400	91.100	92.300
JUL	113.600	106.600	99.600	98.000
AUG	100.800	82.600	70.200	71.500
SEP	99.700	93.400	88.800	87.500
OCT	119.800	100.000	110.800	110.100
NOV	143.300	121.600	.	.
DEC	201.400	181.000	184.500	178.700
CALCIUM (MG/L)			DET'N LIMIT = .100	GUIDELINE = 100 (F2)
FEB	57.400	56.600	.	57.000
APR	44.800	46.800	47.200	47.400
	47.800	47.200	49.400	50.000
MAY	41.000	40.400	40.800	43.600
	48.000	50.800	.	.
JUN	28.000	27.800	25.800	27.200
JUL	32.800	33.200	31.800	31.800
AUG	27.800	30.200	27.600	27.000
SEP	27.800	27.800	26.800	26.200
OCT	60.200	56.200	55.600	55.600
NOV	57.600	57.600	.	.
DEC	79.200	84.200	82.400	82.800
CYANIDE (MG/L)			DET'N LIMIT = 0.001	GUIDELINE = .200 (A1)
FEB	BDL	BDL	.	BDL
APR	BDL	BDL	.	BDL
	BDL	BDL	.	BDL
MAY	BDL	BDL	.	BDL
	BDL	BDL	.	.
JUN	BDL	.003 <T	.	BDL
JUL	BDL	BDL	.	BDL
AUG	BDL	BDL	.	BDL
SEP	.001	.001	.	BDL
OCT	BDL	BDL	.	BDL
NOV	BDL	BDL	.	.
DEC	BDL	BDL	.	BDL
CHLORIDE (MG/L)			DET'N LIMIT = .200	GUIDELINE = 250 (A3)

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ODESSA WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
FEB	17.400	18.700	.	18.800
APR	9.300	11.800	13.100	12.100
	11.200	14.600	14.700	14.300
MAY	12.000	16.000	16.400	16.700
	12.700	17.800	.	.
JUN	13.500	17.700	17.900	18.300
JUL	18.900	23.800	24.200	24.200
AUG	17.500	23.000	27.300	24.900
SEP	18.600	23.800	24.000	23.100
OCT	62.600	62.500	53.400	53.900
NOV	27.300	28.400	.	.
DEC	32.300	34.000	41.500	42.800
COLOUR (HZU)			DET'N LIMIT = .5	GUIDELINE = 5.0 (A3)
FEB	13.500	9.000	.	8.500
APR	15.000	3.500	4.000	115
	20.500	10.000	8.000	6.000
MAY	25.500	1.000 <T	.500 <T	1.500 <T
	24.000	1.000 <T	.	.
JUN	27.500	9.000	10.500	8.500
JUL	29.500	8.500	9.500	8.500
AUG	29.000	5.000	3.500	4.000
SEP	18.000	7.500	9.500	8.000
OCT	49.500	16.500	28.000	29.000
NOV	23.000	5.000	.	.
DEC	25.000	10.000	10.500	9.500
CONDUCTIVITY (UMHO/CM)			DET'N LIMIT = 1	GUIDELINE = 400 (F2)
FEB	387	411	.	395
APR	283	299	308	295
	335	351	115	371
MAY	303	325	329	342
	337	367	.	.
JUN	258	256	247	253
JUL	300	305	297	292
AUG	272	311	310	302
SEP	274	283	278	275
OCT	561	537	500	508
NOV	429	428	.	.
DEC	552	556	593	578
FLUORIDE (MG/L)			DET'N LIMIT = .01	GUIDELINE = 2.400 (A1)
FEB	.090	.090	.	.090

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ODESSA WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
APR	.060	.050	.050	IIS
	.100	.090	IIS	.060
MAY	.070	.050	.050	.050
	.080	.040 <T	.	.
JUN	.070	.070	.080	.080
JUL	.080	.080	.080	.080
AUG	.100	.080	.060	.060
SEP	.080	.080	.100	.080
OCT	.080	.060	.080	.060
NOV	.080	.060	.	.
DEC	.080	.060	.060	.060
HARDNESS (MG/L)			DET'N LIMIT = .500	GUIDELINE = 80-100 (A4)
FEB	192.000	195.000	.	191.000
APR	142.000	145.000	147.000	148.000
	156.000	155.000	161.000	161.000
MAY	141.000	138.000	140.000	146.000
	156.000	163.000	.	.
JUN	115.000	113.000	105.000	111.000
JUL	130.000	132.000	124.000	126.000
AUG	118.000	128.000	120.000	117.000
SEP	120.000	122.000	118.000	116.000
OCT	199.000	187.000	185.000	188.000
NOV	182.000	186.000	.	.
DEC	256.000	271.000	265.000	264.000
IONCAL (DIMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = N/A
FEB	.000 NAF	.000 NAF	.	.000 NAF
APR	.000 NAF	.000 NAF	.000 NAF	.000 NAF
	.000 NAF	.000 NAF	.000 NAF	.000 NAF
MAY	.000 NAF	.000 NAF	.000 NAF	.000 NAF
	.000 NAF	.000 NAF	.	.
JUN	.000 NAF	.000 NAF	.000 NAF	.000 NAF
JUL	.128	1.718	1.240	3.616
AUG	1.851	.158	4.959	5.810
SEP	3.056	3.768	4.115	4.358
OCT	1.370	1.337	1.356	2.900
NOV	3.295	1.437	.	.
DEC	1.156	3.470	.252	2.212
LANGELIERS INDEX (DIMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = N/A
FEB	.595 NAF	.495 NAF	.	.578 NAF
APR	.561 NAF	.392 NAF	.485 NAF	.508 NAF

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DRINKING WATER SURVEILLANCE PROGRAM ODESSA WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
APR	.775 NAF	.773 NAF	.	.745 NAF
MAY	.529 NAF	.039 NAF	.100 NAF	.234 NAF
	.607 NAF	.386 NAF	.	.
JUN	.271 NAF	.262 NAF	.123 NAF	.199 NAF
JUL	.462	.428	.333	.358
AUG	.479	.005	-.245	-.194
SEP	.624	.182	-.004	.021
OCT	.521	.355	.379	.365
NOV	.559	.072	.	.
DEC	.867	1.087	.712	.822
MAGNESIUM (MG/L)		DET'N LIMIT = .050		GUIDELINE = 30 (F2)
FEB	11.900	13.100	.	11.800
APR	7.300	6.900	7.000	7.200
	8.900	9.000	9.000	8.800
MAY	9.300	9.100	9.200	9.100
	8.900	8.800	.	.
JUN	10.900	10.600	10.000	10.500
JUL	11.600	12.000	10.800	11.300
AUG	11.800	12.800	12.400	12.000
SEP	12.400	12.900	12.400	12.200
OCT	11.900	11.400	11.100	11.900
NOV	9.300	10.100	.	.
DEC	14.200	14.800	14.400	14.000
SODIUM (MG/L)		DET'N LIMIT = .200		GUIDELINE = 200 (C3)
FEB	9.600	9.800	.	10.000
APR	5.200	5.600	6.600	5.600
	5.600	5.800	6.000	5.800
MAY	6.400	6.800	7.200	7.000
	6.800	8.000	.	.
JUN	7.800	7.800	7.800	7.800
JUL	9.800	10.000	10.400	10.400
AUG	9.800	9.800	8.800	8.400
SEP	10.400	10.400	10.600	10.600
OCT	37.800	34.400	29.200	30.200
NOV	14.800	12.800	.	.
DEC	16.200	16.200	20.600	20.600
AMMONIUM TOTAL (MG/L)		DET'N LIMIT = 0.002		GUIDELINE = .05 (F2)
FEB	.190	.174	.	.174
APR	.038	.016	.024	!!$
	.048	.008 <T	!!$	.018

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ODESSA WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
MAY	.052	.016	.034	.016
	.200	.078	.	.
JUN	.036	.012	.050	.024
JUL	.064	.024	.152	.034
AUG	.054	.016	.022	.014
SEP	.054	.026	.184	.058
OCT	.026	.010	.040	.064
NOV	.104	.014	.	.
DEC	.010	.050	.100	.028
NITRITE (MG/L)		DET'N LIMIT = 0.001		GUIDELINE = 1.000 (A1)
FEB	.007	.003 <T	.	.002 <T
APR	.060	.002 <T	.002 <T	IIS
	.037	.003 <T	IIS	.002 <T
MAY	.024	.001 <T	.003 <T	.002 <T
	.116	.002 <T	.	.
JUN	.084	.004 <T	.003 <T	.003 <T
JUL	.004 <T	.004 <T	.004 <T	.004 <T
AUG	.003 <T	.003 <T	.003 <T	.003 <T
SEP	.003 <T	.002 <T	.004 <T	.002 <T
OCT	.018	.011	.015	.013
NOV	.006	.001 <T	.	.
DEC	.205	.017	.003 <T	.004 <T
TOTAL NITRATES (MG/L)		DET'N LIMIT = .020		GUIDELINE = 10.000 (A1)
FEB	.275	.275	.	.265
APR	.100	.080 <T	.075 <T	IIS
	.040 <T	BDL	IIS	BDL
MAY	.045 <T	.035 <T	.040 <T	.035 <T
	.125	.030 <T	.	.
JUN	.235	.025 <T	.050 <T	.030 <T
JUL	.030 <T	.035 <T	.045 <T	.030 <T
AUG	BDL	.025 <T	.045 <T	.030 <T
SEP	.055 <T	.060 <T	.130	.045 <T
OCT	.055 <T	.040 <T	.090 <T	.100
NOV	.110	.145	.	.
DEC	.390	.260	.250	.260
NITROGEN TOT KJELD (MG/L)		DET'N LIMIT = .020		GUIDELINE = N/A
FEB	.580	.500	.	.580
APR	.420	.280	.290	IIS
	.460	.370	IIS	.360
MAY	.730	.200	.340	.220

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ODESSA WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
MAY	1.020	.200	.	.
JUN	1.000	.670	.820	.800
JUL	1.020	.780	1.040	.830
AUG	1.170	.710	.740	.640
SEP	1.170	1.080	1.410	1.090
OCT	.880	.820	.950	.980
NOV	.660	.370	.	.
DEC	.750	.500	.650	.460
PH (DIMNSLESS)		DET'N LIMIT = N/A		GUIDELINE = 6.5-8.5(A4)
FEB	8.050	7.970	.	8.050
APR	8.230	8.100	8.190	8.210
	8.360	8.370	IIS	8.350
MAY	8.230	7.870	7.930	7.980
	8.180	8.000	.	.
JUN	8.230	8.260	8.170	8.220
JUL	8.330	8.320	8.270	8.300
AUG	8.460	8.050	7.910	7.960
SEP	8.610	8.200	8.050	8.090
OCT	8.130	8.070	8.050	8.040
NOV	8.090	7.680	.	.
DEC	8.130	8.370	8.000	8.120
PHOSPHORUS FIL REACT (MG/L)		DET'N LIMIT = .0005		GUIDELINE = N/A
FEB	BDL	.000 <T	.	.
APR	.009	.001 <T	.	.
	.008	.001 <T	.	.
MAY	.009	.001 <T	.	.
	.037	.006	.	.
JUN	.018	.001 <T	.	.
JUL	.001 <T	.001 <T	.	.
AUG	.001 <T	.001 <T	.	.
SEP	.001 <T	.001 <T	.	.
OCT	.001 <T	.001 <T	.	.
NOV	.001 <T	.000 <T	.	.
DEC	.001 <T	.001 <T	.	.
PHOSPHORUS TOTAL (MG/L)		DET'N LIMIT = .002		GUIDELINE = .40 (F2)
FEB	.019	BDL	.	.
APR	.019	.002 <T	.	.
	.025	.009 <T	.	.
MAY	.033	.008 <T	.	.
	.070	.013	.	.

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DRINKING WATER SURVEILLANCE PROGRAM ODESSA WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
JUN	.048	.023	.	.
JUL	.016	.017	.	.
AUG	.019	.010	.	.
SEP	.029	.052	.	.
OCT	.020	.017	.	.
NOV	.014	.004 <T	.	.
DEC	.009 <T	.004 <T	.	.
SULPHATE ( )		DET'N LIMIT = .200		GUIDELINE = 500. (A3)
JUL	10.500	10.700	10.800	10.700
AUG	10.900	33.150	35.690	34.770
SEP	12.200	12.200	12.400	12.300
OCT	66.680	67.490	55.570	57.650
NOV	36.000	52.000	.	.
DEC	44.600	63.660	62.830	60.040
TURBIDITY (FTU)		DET'N LIMIT = .02		GUIDELINE = 1.00 (A1)
FEB	.920	.700	.	.600
APR	.900	.280	.260	!!S
	1.180	.540	!!S	.270
MAY	1.690	.370	.600	.360
	3.800	.500	.	.
JUN	1.200	.600	.550	.640
JUL	1.200	.760	.520	.850
AUG	.810	.780	.720	.580
SEP	1.020	.840	.910	.570
OCT	1.870	.890	1.440	1.400
NOV	.560	.740	.	.
DEC	.910	.850	.670	.670

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ODESSA WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
METALS				
SILVER (UG/L)		DET'N LIMIT = .020		GUIDELINE = 50. (A1)
FEB	.030 <T	.020 <T	.	BDL
APR	BDL	BDL	.190 <T	BDL
	BDL	BDL	.030 <T	BDL
MAY	BDL	BDL	.030 <T	BDL
	BDL	.040 <T	.	.
JUN	BDL	BDL	BDL	BDL
JUL	BDL	BDL	.030 <T	BDL
AUG	.080 <T	.050 <T	.060 <T	BDL
SEP	BDL	BDL	BDL	BDL
OCT	.040 <T	.030 <T	.030 <T	BDL
NOV	BDL	BDL	.	.
DEC	BDL	BDL	BDL	BDL
ALUMINUM (UG/L)		DET'N LIMIT = .050		GUIDELINE = 100.(A4)
FEB	6.400	380.000	.	360.000
APR	10.000	160.000	110.000	140.000
	8.800	210.000	240.000	250.000
MAY	12.000	340.000	180.000	220.000
	34.000	240.000	.	.
JUN	24.000	97.000	120.000	110.000
JUL	20.000	38.000	39.000	38.000
AUG	11.000	290.000	220.000	230.000
SEP	9.100	25.000	39.000	30.000
OCT	39.000	280.000	74.000	76.000
NOV	9.300	87.000	.	.
DEC	7.000	380.000	200.000	280.000
ARSENIC (UG/L)		DET'N LIMIT = 0.050		GUIDELINE = 50.0 (A1)
FEB	.320 <T	.340 <T	.	.260 <T
APR	BDL	BDL	BDL	BDL
	BDL	BDL	BDL	BDL
MAY	.460 <T	.430 <T	.490 <T	.460 <T
	.350 <T	2.300	.	.
JUN	.450 <T	.570 <T	.770 <T	.670 <T
JUL	.410 <T	.460 <T	.400 <T	.590 <T
AUG	.760 <T	.650 <T	.730 <T	.670 <T
SEP	.750 <T	.740 <T	.940 <T	1.100
OCT	.540 <T	.490 <T	.530 <T	.550 <T
NOV	.390 <T	.210 <T	.	.
DEC	.370 <T	.140 <T	.360 <T	.470 <T
BARIUM (UG/L)		DET'N LIMIT = 0.020		GUIDELINE = 1000. (A1)

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ODESSA WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
FEB	56.000	52.000	.	51.000
APR	30.000	31.000	36.000	32.000
	26.000	25.000	30.000	30.000
MAY	37.000	40.000	41.000	41.000
	55.000	62.000	.	.
JUN	39.000	24.000	23.000	26.000
JUL	56.000	45.000	46.000	50.000
AUG	45.000	50.000	54.000	55.000
SEP	43.000	39.000	41.000	39.000
OCT	56.000	90.000	78.000	74.000
NOV	52.000	48.000	.	.
DEC	71.000	54.000	63.000	55.000
BORON (UG/L)		DET'N LIMIT = 0.200		GUIDELINE = 5000. (A1)
FEB	20.000	21.000	.	18.000 <T
APR	14.000 <T	16.000 <T	17.000 <T	17.000 <T
	16.000 <T	26.000	22.000	19.000 <T
MAY	21.000	15.000 <T	11.000 <T	8.400 <T
	27.000	20.000 <T	.	.
JUN	33.000	27.000	29.000	32.000
JUL	45.000	42.000	55.000	52.000
AUG	42.000	32.000	46.000	45.000
SEP	55.000	37.000	73.000	43.000
OCT	27.000	40.000	35.000	31.000
NOV	77.000	95.000	.	.
DEC	93.000	35.000	87.000	49.000
BERYLLIUM (UG/L)		DET'N LIMIT = 0.010		GUIDELINE = .20 (H)
FEB	BDL	BDL	.	BDL
APR	.040 <T	BDL	.020 <T	BDL
	.060 <T	.030 <T	.020 <T	.030 <T
MAY	BDL	.050 <T	.030 <T	.060 <T
	BDL	.030 <T	.	.
JUN	BDL	BDL	BDL	BDL
JUL	BDL	BDL	BDL	.030 <T
AUG	BDL	BDL	.030 <T	BDL
SEP	.050 <T	.030 <T	.100 <T	.020 <T
OCT	.050 <T	.020 <T	BDL	.040 <T
NOV	.110 <T	.100 <T	.	.
DEC	.150 <T	.020 <T	.130 <T	.030 <T
CADMIUM (UG/L)		DET'N LIMIT = 0.050		GUIDELINE = 5.000 (A1)
FEB	BDL	BDL	.	BDL

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ODESSA WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
APR	BDL	BDL	BDL	BDL
	BDL	BDL	.200 <T	BDL
MAY	BDL	BDL	BDL	BDL
	BDL	BDL	.	.
JUN	BDL	BDL	BDL	BDL
JUL	BDL	BDL	.220 <T	BDL
AUG	BDL	BDL	.360 <T	BDL
SEP	BDL	BDL	BDL	BDL
OCT	.070 <T	BDL	.400 <T	BDL
NOV	BDL	BDL	.	.
DEC	BDL	BDL	BDL	BDL
COBALT (UG/L)		DET'N LIMIT = 0.020		GUIDELINE = 1000 (H)
FEB	.020 <T	.040 <T	.	.050 <T
APR	.460 <T	.460 <T	.550 <T	.440 <T
	.100 <T	.090 <T	.100 <T	.060 <T
MAY	.110 <T	.130 <T	.250 <T	.140 <T
	.130 <T	1.400	.	.
JUN	.100 <T	.060 <T	.060 <T	.070 <T
JUL	10.000	.100 <T	.140 <T	.120 <T
AUG	.100 <T	.080 <T	.130 <T	.050 <T
SEP	.120 <T	.120 <T	.170 <T	.140 <T
OCT	.110 <T	.050 <T	.070 <T	.080 <T
NOV	.180 <T	.170 <T	.	.
DEC	.280 <T	.170 <T	.170 <T	.130 <T
CHROMIUM (UG/L)		DET'N LIMIT = 0.100		GUIDELINE = 50. (A1)
FEB	.110 <T	.480 <T	.	.130 <T
APR	.430 <T	.290 <T	.160 <T	.210 <T
	.510 <T	2.000	.770 <T	.470 <T
MAY	.690 <T	1.200	.110 <T	.130 <T
	.710 <T	4.000	.	.
JUN	.480 <T	.450 <T	BDL	.570 <T
JUL	.340 <T	.280 <T	.310 <T	.340 <T
AUG	BDL	BDL	BDL	BDL
SEP	1.600	.870 <T	3.400	.620 <T
OCT	.370 <T	.570 <T	.570 <T	.360 <T
NOV	5.900	7.500	.	.
DEC	7.100	.870 <T	6.400	.680 <T
COPPER (UG/L)		DET'N LIMIT = .100		GUIDELINE = 1000 (A3)
FEB	.360 <T	.370 <T	.	6.200
APR	.340 <T	.420 <T	43.000	5.500

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ODESSA WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
APR	.360 <T	.410 <T	74.000	5.900
MAY	.540 <T	.250 <T	92.000	9.500
	.570 <T	.660 <T	.	.
JUN	.430 <T	.310 <T	56.000	8.300
JUL	.560 <T	.740 <T	42.000	22.000
AUG	.550 <T	.520 <T	62.000	17.000
SEP	.560 <T	.490 <T	110.000	13.000
OCT	1.300	1.100	190.000	15.000
NOV	.800 <T	.760 <T	.	.
DEC	.870 <T	.900 <T	91.000	13.000
IRON (UG/L)		DET'N LIMIT = 4.000		GUIDELINE = 300. (A3)
FEB	65.000	46.000	.	42.000
APR	83.000	17.000 <T	13.000 <T	9.500 <T
	110.000	36.000 <T	24.000 <T	23.000 <T
MAY	100.000	15.000 <T	13.000 <T	26.000 <T
	170.000	25.000 <T	.	.
JUN	51.000	21.000 <T	20.000 <T	20.000 <T
JUL	50.000 <T	19.000 <T	18.000 <T	18.000 <T
AUG	25.000 <T	BDL	5.600 <T	BDL
SEP	13.000 <T	8.300 <T	BDL	5.100 <T
OCT	100.000	46.000 <T	49.000 <T	61.000
NOV	21.000 <T	BDL	.	.
DEC	130.000	40.000 <T	31.000 <T	35.000 <T
MERCURY (UG/L)		DET'N LIMIT = 0.010		GUIDELINE = 1.000 (A1)
FEB	BDL	BDL	.	BDL
APR	BDL	BDL	.	BDL
	.010	BDL	.	BDL
MAY	BDL	BDL	.	BDL
	BDL	BDL	.	.
JUN	.020 <T	BDL	.	BDL
JUL	.020 <T	.020 <T	.	BDL
AUG	.020 <T	.020 <T	.	ISS
SEP	.020 <T	.030 <T	.	BDL
OCT	.040 <T	.030 <T	.	BDL
NOV	.290	.020 <T	.	.
DEC	.030 <T	.020 <T	.	BDL
MANGANESE (UG/L)		DET'N LIMIT = .050		GUIDELINE = 50.0 (A3)
FEB	31.000	24.000	.	23.000
APR	15.000	9.000	8.200	8.000
	33.000	7.900	12.000	14.000

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ODESSA WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
MAY	29.000	13.000	6.900	9.800
	82.000	57.000	.	.
JUN	14.000	4.800	5.100	4.200
JUL	19.000	2.400	2.300	2.200
AUG	6.300	.880	1.100	.920
SEP	9.200	6.300	6.100	5.800
OCT	50.000	2.700	2.400	2.100
NOV	6.400	3.000	.	.
DEC	68.000	27.000	32.000	33.000
MOLYBDENUM (UG/L)		DET'N LIMIT = 0.020		GUIDELINE = 500 (H)
FEB	.160 <T	.180 <T	.	.180 <T
APR	.150 <T	.140 <T	.200 <T	.180 <T
	.120 <T	.220 <T	.130 <T	.150 <T
MAY	.060 <T	.230 <T	.260 <T	.240 <T
	.120 <T	.280 <T	.	.
JUN	.030 <T	.070 <T	.080 <T	.160 <T
JUL	.030 <T	.070 <T	.080 <T	.080 <T
AUG	.040 <T	BDL	.030 <T	.040 <T
SEP	BDL	BDL	.030 <T	.030 <T
OCT	.260 <T	.230 <T	.200 <T	.180 <T
NOV	.250 <T	.190 <T	.	.
DEC	.240 <T	.240 <T	.190 <T	.250 <T
NICKEL (UG/L)		DET'N LIMIT = 0.100		GUIDELINE = 50. (F3)
FEB	BDL	BDL	.	BDL
APR	1.400 <T	1.500	4.400	1.300 <T
	.490 <T	.220 <T	9.400	.300 <T
MAY	.130 <T	BDL	9.200	.400 <T
	BDL	1.700 <T	.	.
JUN	BDL	BDL	4.600	BDL
JUL	.160 <T	.270 <T	4.800	.290 <T
AUG	BDL	BDL	8.300	BDL
SEP	BDL	BDL	8.200	.110 <T
OCT	.350 <T	.110 <T	3.100	.660 <T
NOV	BDL	BDL	.	.
DEC	BDL	BDL	1.300 <T	BDL
LEAD (UG/L)		DET'N LIMIT = 0.050		GUIDELINE = 50. (A1)
FEB	3.200	.170 <T	.	.430
APR	.400	.110 <T	3.200	.640
	3.100	.140 <T	5.800	.610
MAY	1.100	.200 <T	5.600	.920

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ODESSA WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
MAY	.910	.320	.	.
JUN	.860	.300	3.600	1.100
JUL	1.700	.350	8.500	2.900
AUG	.550	.150 <T	8.600	2.300
SEP	.600	.070 <T	14.000	2.000
OCT	.710	.220	24.000	4.500
NOV	.330	.060 <T	.	.
DEC	.170 <T	.100 <T	6.600	2.000
ANTIMONY (UG/L)		DET'N LIMIT = .050		GUIDELINE = 146. (D4)
FEB	.090 <T	.060 <T	.	.090 <T
APR	.070 <T	.050 <T	.140 <T	.080 <T
	.110 <T	.090 <T	.100 <T	.100 <T
MAY	.060 <T	.030 <T	.080 <T	.040 <T
	.080 <T	.060 <T	.	.
JUN	.080 <T	.050 <T	.110 <T	.090 <T
JUL	20.000	.660	.530	.700
AUG	.430	.440	.460	.420
SEP	.470	.480	.490	.450
OCT	.130 <T	.160 <T	.180 <T	.100 <T
NOV	.240	.200 <T	.	.
DEC	.370	.290	.300	.310
SELENIUM (UG/L)		DET'N LIMIT = 0.200		GUIDELINE = 10. (A1)
FEB	.800 <T	.730 <T	.	.840 <T
APR	BDL	BDL	BDL	BDL
	BDL	.580 <T	.640 <T	.810 <T
MAY	.780 <T	.780 <T	.260 <T	.220 <T
	.740 <T	.790 <T	.	.
JUN	.500 <T	BDL	1.400 <T	2.400 <T
JUL	1.600 <T	1.200 <T	1.700 <T	.340 <T
AUG	BDL	2.600 <T	3.700 <T	1.100 <T
SEP	BDL	.800 <T	3.200 <T	2.500 <T
OCT	.790 <T	1.200 <T	1.500 <T	1.300 <T
NOV	1.500 <T	2.300 <T	.	.
DEC	.930 <T	1.800 <T	2.000 <T	1.600 <T
STRONTIUM (UG/L)		DET'N LIMIT = .050		GUIDELINE = 2000.(H)
FEB	1200.000	1200.000	.	1200.000
APR	790.000	770.000	810.000	800.000
	1000.000	1000.000	1100.000	1100.000
MAY	990.000	960.000	990.000	990.000
	1000.000	1100.000	.	.

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ODESSA WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
JUN	950.000	930.000	840.000	910.000
JUL	1200.000	1100.000	1100.000	1200.000
AUG	960.000	990.000	1000.000	1000.000
SEP	990.000	1000.000	950.000	960.000
OCT	900.000	1100.000	830.000	870.000
NOV	910.000	850.000	.	.
DEC	1600.000	1500.000	1600.000	1400.000
TITANIUM (UG/L)			DET'N LIMIT = .050	GUIDELINE = N/A
FEB	9.200	9.300	.	8.800
APR	7.600	6.900	7.300	6.700
	5.400	4.600	5.000	4.100
MAY	5.900	4.200	4.800	4.100
	9.500	6.000	.	.
JUN	10.000	9.500	9.100	8.500
JUL	8.200	6.000	5.900	6.100
AUG	15.000	14.000	14.000	13.000
SEP	14.000	13.000	14.000	14.000
OCT	9.700	7.500	8.100	7.800
NOV	7.800	7.300	.	.
DEC	6.400	5.600	6.900	6.700
THALLIUM (UG/L)			DET'N LIMIT = .010	GUIDELINE = 13. (D4)
FEB	BDL	BDL	.	BDL
APR	BDL	BDL	BDL	BDL
	BDL	BDL	BDL	BDL
MAY	.050 <T	.040 <T	.040 <T	.030 <T
	BDL	BDL	.	.
JUN	.040 <T	.040 <T	BDL	.030 <T
JUL	BDL	BDL	BDL	BDL
AUG	BDL	BDL	BDL	BDL
SEP	BDL	BDL	BDL	BDL
OCT	BDL	BDL	BDL	BDL
NOV	BDL	BDL	.	.
DEC	BDL	BDL	BDL	BDL
URANIUM (UG/L)			DET'N LIMIT = .020	GUIDELINE = 20. (A2)
FEB	.130 <T	.190 <T	.	.210
APR	.110 <T	.040 <T	.110 <T	.060 <T
	.170 <T	.160 <T	.130 <T	.100 <T
MAY	.060 <T	BDL	BDL	BDL
	.090 <T	.030 <T	.	.
JUN	BDL	.090 <T	.040 <T	.050 <T

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ODESSA WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
JUL	BDL	.080 <T	BDL	BDL
AUG	.060 <T	.030 <T	BDL	.030 <T
SEP	.080 <T	.070 <T	BDL	.070 <T
OCT	.180 <T	.090 <T	.140 <T	.130 <T
NOV	.170 <T	.090 <T	.	.
DEC	.200 <T	.170 <T	.180 <T	.140 <T
VANADIUM (UG/L)		DET'N LIMIT = .050		GUIDELINE = 100 (N)
FEB	.210 <T	.190 <T	.	.170 <T
APR	.350 <T	.270 <T	.320 <T	.330 <T
	.340 <T	.220 <T	.260 <T	.210 <T
MAY	.430 <T	.280 <T	.230 <T	.220 <T
	.520	.200 <T	.	.
JUN	.490 <T	.830	.940	.940
JUL	.330 <T	.550	.620	.590
AUG	.510	.400 <T	.340 <T	.310 <T
SEP	.680	.590	.650	.680
OCT	.660	.480 <T	.530	.550
NOV	.420 <T	.350 <T	.	.
DEC	.320 <T	.270 <T	.320 <T	.260 <T
ZINC (UG/L)		DET'N LIMIT = .001		GUIDELINE = 5000. (A3)
FEB	1.800	.690 <T	.	1.800
APR	1.100	.980 <T	12.000	4.800
	1.500	.670 <T	21.000	2.700
MAY	1.500	4.000	33.000	4.500
	2.000	2.400	.	.
JUN	1.400	1.300	8.200	1.500
JUL	2.100	1.200	16.000	4.000
AUG	1.200	3.400	19.000	3.700
SEP	1.300	2.100	27.000	2.800
OCT	7.300	3.600	25.000	5.000
NOV	3.100	6.000	.	.
DEC	3.500	5.300	19.000	6.300

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ODESSA WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
PESTICIDES & PCB ALPHA BHC (NG/L)		DET'N LIMIT = 1.000		GUIDELINE = 700 (G)
FEB	BDL	BDL	.	BDL
APR	BDL	BDL	.	BDL
	BDL	BDL	.	BDL
MAY	BDL	BDL	.	BDL
	1.000 <T	BDL	.	.
JUN	BDL	BDL	.	BDL
JUL	BDL	BDL	.	!LA
AUG	BDL	BDL	.	BDL
SEP	1.000 <T	BDL	.	BDL
OCT	BDL	BDL	.	BDL
NOV	1.000 <T	BDL	.	.
DEC	BDL	BDL	.	BDL

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM CESSSA WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
PHENOLICS (UG/L)		DET'N LIMIT = 0.2		GUIDELINE = 2.00 (A3)
FEB	.400 <T	BDL	.	.
APR	BDL	BDL	.	.
	BDL	.200 <T	.	.
MAY	2.400	6.000	.	.
	.200 <T	BDL	.	.
JUN	6.000	4.800	.	.
JUL	3.800	3.000	.	.
AUG	3.200	2.800	.	.
SEP	8.400	7.600	.	.
OCT	8.000	6.000	.	.
NOV	5.400	5.000	.	.
DEC	2.000	2.000	.	.

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ODESSA WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
VOLATILES				
BENZENE (UG/L)		DET'N LIMIT = .050		GUIDELINE = 5.0 (81)
APR	BDL	BDL	.	BDL
	BDL	BDL	.	BDL
MAY	BDL	BDL	.	BDL
	BDL	BDL	.	.
JUN	BDL	BDL	.	BDL
JUL	BDL	BDL	.	BDL
AUG	BDL	.100 <T	.	BDL
SEP	BDL	BDL	.	BDL
OCT	BDL	BDL	.	BDL
NOV	BDL	BDL	.	.
DEC	BDL	BDL	.	BDL
TOLUENE (UG/L)		DET'N LIMIT = .050		GUIDELINE = 24.0 (84)
APR	BDL	.050 <T	.	BDL
	BDL	BDL	.	BDL
MAY	BDL	BDL	.	BDL
	BDL	BDL	.	.
JUN	.050 <T	.050 <T	.	.050 <T
JUL	BDL	BDL	.	BDL
AUG	BDL	BDL	.	BDL
SEP	BDL	BDL	.	BDL
OCT	BDL	BDL	.	BDL
NOV	BDL	BDL	.	.
DEC	BDL	.050 <T	.	.200 <T
ETHYLBENZENE (UG/L)		DET'N LIMIT = .050		GUIDELINE = 2.4 (84)
APR	BDL	BDL	.	BDL
	BDL	BDL	.	BDL
MAY	BDL	BDL	.	BDL
	BDL	BDL	.	.
JUN	BDL	.150 <T	.	.050 <T
JUL	.050 <T	BDL	.	.050 <T
AUG	BDL	BDL	.	.100 <T
SEP	.100 <T	.100 <T	.	.100 <T
OCT	BDL	BDL	.	.050 <T
NOV	BDL	.050 <T	.	.
DEC	BDL	BDL	.	.100 <T
O-XYLENE (UG/L)		DET'N LIMIT = .050		GUIDELINE = 300 (84)
APR	BDL	.050 <T	.	BDL
	BDL	BDL	.	BDL

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ODESSA WTP 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
MAY	BDL	BDL	.	BDL
	BDL	BDL	.	.
JUN	BDL	BDL	.	BDL
JUL	BDL	BDL	.	BDL
AUG	BDL	.050 <T	.	BDL
SEP	BDL	BDL	.	.050 <T
OCT	BDL	BDL	.	BDL
NOV	BDL	BDL	.	.
DEC	BDL	BDL	.	.050 <T
STYRENE (UG/L)		DET'N LIMIT = .050		GUIDELINE = 46.5 (D2)
OCT	.100 <T	.200 <T	.	.450 <T
NOV	BDL	BDL	.	.
DEC	BDL	.200 <T	.	.450 <T
CHLOROFORM (UG/L)		DET'N LIMIT = .100		GUIDELINE = 350 (A1+)
APR	BDL	63.800	.	61.700
	BDL	64.200	.	62.500
MAY	BDL	10.400	.	22.900
	BDL	4.400	.	.
JUN	BDL	102.000	.	82.300
JUL	.300 <T	181.400	.	148.000
AUG	.100 <T	144.000	.	194.000
SEP	BDL	195.000	.	170.000
OCT	2.400	145.000	.	116.000
NOV	.400 <T	118.000	.	.
DEC	BDL	36.600	.	53.300
DICHLOROBROMOMETHANE (UG/L)		DET'N LIMIT = .050		GUIDELINE = 350 (A1+)
APR	BDL	6.700	.	6.700
	BDL	10.900	.	10.600
MAY	BDL	4.200	.	4.650
	BDL	.450 <T	.	.
JUN	BDL	10.100	.	9.850
JUL	BDL	23.400	.	15.200
AUG	BDL	26.100	.	32.650
SEP	BDL	33.400	.	26.300
OCT	.250 <T	18.950	.	15.500
NOV	BDL	18.200	.	.
DEC	BDL	9.250	.	13.200
CHLORODIBROMOMETHANE (UG/L)		DET'N LIMIT = .100		GUIDELINE = 350 (A1+)
APR	BDL	1.000	.	.300 <T

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM ODESSA WTP 1988

	WATER TREATMENT PLANT			DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1		
			STANDING	FREE FLOW	
APR	BDL	.200 <T	.	.200 <T	
MAY	BDL	2.100	.	1.200	
	BDL	.100 <T	.	.	
JUN	BDL	1.100	.	1.600	
JUL	BDL	2.400	.	1.700	
AUG	BDL	2.200	.	3.200	
SEP	BDL	3.500	.	3.600	
OCT	BDL	.800 <T	.	.600 <T	
NOV	BDL	1.700	.	.	
DEC	BDL	.800 <T	.	1.000	
T-CHLOROETHYLENE (UG/L)		DET'N LIMIT = .050		GUIDELINE = 10.0 (C2)	
APR	BDL	BDL	.	BDL	
	BDL	BDL	.	BDL	
MAY	BDL	BDL	.	BDL	
	BDL	BDL	.	.	
JUN	BDL	BDL	.	BDL	
JUL	BDL	BDL	.	BDL	
AUG	BDL	BDL	.	BDL	
SEP	BDL	BDL	.	.050 <T	
OCT	BDL	BDL	.	BDL	
NOV	BDL	BDL	.	.	
DEC	BDL	BDL	.	BDL	
TOTL TRIHALOMETHANES (UG/L)		DET'N LIMIT = .500		GUIDELINE = 350 (A1)	
APR	BDL	71.500	.	68.700	
	BDL	75.300	.	73.300	
MAY	BDL	16.700	.	28.750	
	BDL	4.950 <T	.	.	
JUN	BDL	113.200	.	93.550	
JUL	BDL	207.200	.	164.900	
AUG	BDL	172.300	.	229.850	
SEP	BDL	231.900	.	199.900	
OCT	2.650 <T	164.800	.	132.100	
NOV	BDL	137.900	.	.	
DEC	BDL	46.650	.	67.500	

Table 6

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
BACTERIOLOGICAL			
STANDARD PLATE COUNT MEMBRANE	CT/ML	0	500/ML(A1)
FILTRATION P/A BOTTLE		0	0 (A1*)
TOTAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	5/100mL(A1)
TOTAL COLIFORM BACKGROUND MF	CT/100ML	0	N/A
CHLOROAROMATICS			
HEXACHLOROBUTADIENE	NG/L	1.000	450. (D4)
1,2,3-TRICHLOROBENZENE	NG/L	5.000	10000 (I)
1,2,3,4-TETRACHLOROBENZENE	NG/L	1.000	10000 (I)
1,2,3,5-TETRACHLOROBENZENE	NG/L	1.000	10000 (I)
1,2,4-TRICHLOROBENZENE	NG/L	5.000	10000 (I)
1,2,4,5-TETRACHLOROBENZENE	NG/L	1.000	38000 (D4)
1,3,5-TRICHLOROBENZENE	NG/L	5.000	10000 (D4)
HEXACHLOROBENZENE	NG/L	1.0	10. (C1)
HEXACHLOROETHANE	NG/L	1.000	1900. (D4)
OCTACHLOROSTYRENE	NG/L	1.000	N/A
PENTACHLOROBENZENE	NG/L	1.000	74000 (D4)
2,3,6-TRICHLOROTOLUENE	NG/L	5.000	N/A
2,4,5-TRICHLOROTOLUENE	NG/L	5.000	N/A
2,6,A-TRICHLOROTOLUENE	NG/L	5.000	N/A
CHLOROPHENOLS			
2,3,4-TRICHLOROPHENOL	NG/L	50.	N/A
2,3,4,5-TETRACHLOROPHENOL	NG/L	50.	N/A
2,3,5,6-TETRACHLOROPHENOL	NG/L	50.	N/A
2,4,5-TRICHLOROPHENOL	NG/L	50.	2600000 (D4)
2,4,6-TRICHLOROPHENOL	NG/L	50.	5000. (B1)
PENTACHLOROPHENOL	NG/L	50.	60000. (B1)
CHEMISTRY (FLD)			
FIELD COMBINED CHLORINE RESIDUAL	MG/L	N/A	N/A
FIELD FREE CHLORINE RESIDUAL	MG/L	N/A	N/A
FIELD TOTAL CHLORINE RESIDUAL	MG/L	N/A	N/A
FIELD PH	DMSNLESS	N/A	6.5-8.5(A4)
FIELD TEMPERATURE	°C	N/A	<15 °C(A1)
FIELD TURBIDITY	FTU	N/A	1.0 (A1)
CHEMISTRY (LAB)			
ALKALINITY	MG/L	.200	30-500(A4)
CALCIUM	MG/L	.100	100. (F2)
CYANIDE	MG/L	.001	.20(A1)
CHLORIDE	MG/L	.200	250. (A3)
COLOUR	TCU	.5	5.0 (A3)
CONDUCTIVITY	UMHO/CM	1.	400. (F2)
FLUORIDE	MG/L	.01	2.4 (A1)
HARDNESS	MG/L	.50	80-100(A4)
MAGNESIUM	MG/L	.05	30. (F2)
SODIUM	MG/L	.20	200. (C3)
AMMONIUM TOTAL	MG/L	.002	.05(F2)
NITRITE	MG/L	.001	1.0 (A1)
TOTAL NITRATES	MG/L	.02	10. (A1)
NITROGEN TOTAL KJELDAHL	MG/L	.02	N/A
PH	DMSNLESS	N/A	6.5-8.5(A4)
PHOSPHORUS FIL REACT	MG/L	.0005	N/A
PHOSPHORUS TOTAL	MG/L	.002	.40(F2)
TOTAL SOLIDS	MG/L	1.	500. (A3)
TURBIDITY	FTU	.02	1.0 (A1)
METALS			

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
BERYLLIUM	UG/L	.010	0.20 (N)
CADMIUM	UG/L	.050	5.0 (A1)
COBALT	UG/L	.020	1000. (N)
CHROMIUM	UG/L	.100	50. (A1)
COPPER	UG/L	.100	1000. (A3)
IRON	UG/L	4.0	300. (A3)
MERCURY	UG/L	.01	1.0 (A1)
MANGANESE	UG/L	.050	50. (A3)
MOLYBDENUM	UG/L	.020	500. (N)
NICKEL	UG/L	.100	50. (F3)
LEAD	UG/L	.050	50. (A1)
SELENIUM	UG/L	.200	10. (A1)
SILVER	UG/L	.020	50. (A1)
STRONTIUM	UG/L	.050	2000. (N)
THALLIUM	UG/L	.010	13. (D4)
TITANIUM	UG/L	.050	N/A
URANIUM	UG/L	.020	20. (A2)
VANADIUM	UG/L	.050	100. (N)
ZINC	UG/L	.020	500. (A3)
PHENOLICS			
PHENOLICS (UNFILTERED REACTIVE)	UG/L	.2	2.0 (A3)
PESTICIDES & PCB			
ALDRIN	NG/L	1.0	700. (A1)
AMETRINE	NG/L	50.	300000. (D3)
ATRAZINE	NG/L	50.	60000. (B3)
ALPHA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	700. (G)
BETA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	300. (G)
GAMMA HEXACHLOROCYCLOHEXANE(LINDANE)	NG/L	1.0	4000. (A1)
ALPHA CHLORDANE	NG/L	2.0	7000. (A1)
GAMMA CHLORDANE	NG/L	2.0	7000. (A1)
BLADEX	NG/L	100.	10000. (B3)
DIELDRIN	NG/L	2.0	700. (A1)
METHOXYCHLOR	NG/L	5.0	100000. (A1)
ENDOSULFAN 1 (THIODAN I)	NG/L	2.0	74000. (D4)
ENDOSULFAN 2 (THIODAN II)	NG/L	4.0	74000. (D4)
ENDRIN	NG/L	4.0	200. (A1)
ENDOSULFAN SULPHATE(THIODAN SULPHATE)	NG/L	4.0	N/A
HEPTACHLOR EPOXIDE	NG/L	1.0	3000. (A1)
HEPTACHLOR	NG/L	1.0	3000. (A1)
METOLACHLOR	NG/L	500.	50000. (B3)
MIREX	NG/L	5.0	N/A
OXYCHLORDANE	NG/L	2.0	N/A
O,P-DDT	NG/L	5.0	30000. (A1)
PCB	NG/L	20.0	3000. (A2)
O,P-DDD	NG/L	5.0	N/A
PPDDE	NG/L	1.0	30000. (A1)
PPDDT	NG/L	5.0	30000. (A1)
ATRATONE	NG/L	50.	N/A
ALACHLOR	NG/L	500.	35000. (D2)
PROMETONE	NG/L	50.	52500. (D3)
PROPAZINE	NG/L	50.	16000. (D2)
PROMETRYNE	NG/L	50.	1000. (B3)
SENCOR (METRIBUZIN)	NG/L	100.	80000. (B2)
SIMAZINE	NG/L	50.	10000. (B3)
POLYAROMATIC HYDROCARBONS			
PHENANTHRENE	NG/L	10.0	N/A
ANTHRACENE	NG/L	1.0	N/A
FLUORANTHENE	NG/L	20.0	42000. (D4)
PYRENE	NG/L	20.0	N/A
BENZO(A)ANTHRACENE	NG/L	20.0	N/A
CHRYSENE	NG/L	50.0	N/A
DIMETHYL BENZO(A)ANTHRACENE	NG/L	5.0	N/A
BENZO(E)PYRENE	NG/L	50.0	N/A
BENZO(B)FLUORANTHENE	NG/L	10.0	N/A
PERYLENE	NG/L	10.0	N/A
BENZO(K)FLUORANTHENE	NG/L	1.0	N/A
BENZO(A)PYRENE	NG/L	5.0	10. (B1)
BENZO(G,H,I)PERYLENE	NG/L	20.0	N/A

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE	
DIBENZO(A,H)ANTHRACENE	NG/L	10.0	N/A	
INDENO(1,2,3-C,D)PYRENE	NG/L	20.0	N/A	
BENZO(B)CHRYSENE	NG/L	2.0	N/A	
CORONENE	NG/L	10.0	N/A	
SPECIFIC PESTICIDES				
TOXAPHENE	NG/L	N/A	5000.	(A1)
2,4,5-TRICHLOROBUTYRIC ACID (2,4,5-T)	NG/L	50.	280000.	(B1)
2,4-DICHLOROBUTYRIC ACID (2,4-D)	NG/L	100.	100000.	(A1)
2,4-DICHLORORPHENOXYBUTYRIC ACID	NG/L	200.	18000.	(B3)
2,4-D PROPIONIC ACID	NG/L	100.	N/A	
DICAMBA	NG/L	100.	87000.	(B3)
PICHLORAM	NG/L	100.	2450000.	(C3)
SILVEX (2,4,5-TP)	NG/L	50.	10000.	(A1)
DIAZINON	NG/L	20.	14000.	(A1)
DICHLOROVOS	NG/L	20.	N/A	
DURSBAN	NG/L	20.	N/A	
ETHION	NG/L	20.	35000.	(G)
GUTHION	NG/L	N/A	N/A	
MALATHION	NG/L	20.	160000.	(G)
MEVINPHOS	NG/L	20.	N/A	
METHYL PARATHION	NG/L	50.	7000.	(B3)
METHYLTRITHION	NG/L	20.	N/A	
PARATHION	NG/L	20.	35000.	(B1)
PHORATE (THIMET)	NG/L	20.	35.	(D2)
RELDAN	NG/L	20.	N/A	
RONNEL	NG/L	20.	N/A	
AMINOCARB	NG/L	N/A	N/A	
BENOMYL	NG/L	N/A	N/A	
BUX (METALKAMATE)	NG/L	2000.	N/A	
CARBOFURAN	NG/L	2000.	18000.	(D3)
CIPC (CHLORPROPHAM)	NG/L	2000.	350000.	(G)
DIALLATE	NG/L	2000.	30000.	(H)
EPTAM	NG/L	2000.	N/A	
IPC	NG/L	2000.	N/A	
PROPOXUR (BAYGON)	NG/L	2000.	90000.	(G)
SEVIN (CARBARYL)	NG/L	200.	70000.	(A1)
SUTAN (BUTYLATE)	NG/L	2000.	245000.	(D3)
VOLATILES				
BENZENE	UG/L	.050	5.0	(B1)
TOLUENE	UG/L	.050	24.0	(B4)
ETHYLBENZENE	UG/L	.050	2.4	(B4)
PARA-XYLENE	UG/L	.100	300.	(B4)
META-XYLENE	UG/L	.100	300.	(B4)
ORTHO-XYLENE	UG/L	.050	300.	(B4)
1,1-DICHLOROETHYLENE	UG/L	.100	7.0	(D1)
ETHLYENE DIBROMIDE	UG/L	.05	50.	(G)
METHYLENE CHLORIDE	UG/L	.500	1750.	(D3)
TRANS-1,2-DICHLOROETHYLENE	UG/L	.100	350.	(D3)
1,1-DICHLOROETHANE	UG/L	.100	N/A	
CHLOROFORM	UG/L	.100	350.	(A1+)
1,1,1-TRICHLOROETHANE	UG/L	.020	200.	(D1)
1,2-DICHLOROETHANE	UG/L	.050	5.0	(D1)
CARBON TETRACHLORIDE	UG/L	.200	5.0	(D1)
1,2-DICHLOROPROPANE	UG/L	.050	10.0	(G)
TRICHLOROETHYLENE	UG/L	.100	5.0	(D1)
DICHLOROBROMOMETHANE	UG/L	.050	350.	(A1+)
1,1,2-TRICHLOROETHANE	UG/L	.050	.60	(D4)
CHLORODIBROMOMETHANE	UG/L	.100	350.	(A1+)
TETRACHLOROETHYLENE	UG/L	.050	10.0	(C2)
BROMOFORM	UG/L	.200	350.	(A1+)
1,1,2,2-TETRACHLOROETHANE	UG/L	.050	0.17	(D4)
CHLOROBENZENE	UG/L	.100	1510.	(D3)
1,4-DICHLOROBENZENE	UG/L	.100	5.0	(B1)
1,3-DICHLOROBENZENE	UG/L	.100	130.	(G)
1,2-DICHLOROBENZENE	UG/L	.050	200.	(B1)
TRIFLUOROCHLOROTOLUENE	UG/L	.100	N/A	

Table 6

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
BACTERIOLOGICAL			
STANDARD PLATE COUNT MEMBRANE FILTRATION	CT/ML	0	500/ML(A1)
P/A BOTTLE		0	0 (A1*)
TOTAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	5/100mL(A1)
TOTAL COLIFORM BACKGROUND MF	CT/100ML	0	N/A
CHLOROAROMATICS			
HEXACHLOROBUTADIENE	NG/L	1.000	450. (D4)
1,2,3-TRICHLOROBENZENE	NG/L	5.000	10000 (I)
1,2,3,4-TETRACHLOROBENZENE	NG/L	1.000	10000 (I)
1,2,3,5-TETRACHLOROBENZENE	NG/L	1.000	10000 (I)
1,2,4-TRICHLOROBENZENE	NG/L	5.000	10000 (I)
1,2,4,5-TETRACHLOROBENZENE	NG/L	1.000	38000 (D4)
1,3,5-TRICHLOROBENZENE	NG/L	5.000	10000 (D4)
HEXACHLOROBENZENE	NG/L	1.0	10. (C1)
HEXACHLOROETHANE	NG/L	1.000	1900. (D4)
OCTACHLOROSTYRENE	NG/L	1.000	N/A
PENTACHLOROBENZENE	NG/L	1.000	74000 (D4)
2,3,6-TRICHLOROTOLUENE	NG/L	5.000	N/A
2,4,5-TRICHLOROTOLUENE	NG/L	5.000	N/A
2,6,A-TRICHLOROTOLUENE	NG/L	5.000	N/A
CHLOROPHENOLS			
2,3,4-TRICHLOROPHENOL	NG/L	50.	N/A
2,3,4,5-TETRACHLOROPHENOL	NG/L	50.	N/A
2,3,5,6-TETRACHLOROPHENOL	NG/L	50.	N/A
2,4,5-TRICHLOROPHENOL	NG/L	50.	2600000 (D4)
2,4,6-TRICHLOROPHENOL	NG/L	50.	5000. (B1)
PENTACHLOROPHENOL	NG/L	50.	60000. (B1)
CHEMISTRY (FLD)			
FIELD COMBINED CHLORINE RESIDUAL	MG/L	N/A	N/A
FIELD FREE CHLORINE RESIDUAL	MG/L	N/A	N/A
FIELD TOTAL CHLORINE RESIDUAL	MG/L	N/A	N/A
FIELD PH	DIMSNLESS	N/A	6.5-8.5(A4)
FIELD TEMPERATURE	^{o}C	N/A	<15 ^{o}C(A1)
FIELD TURBIDITY	FTU	N/A	1.0 (A1)
CHEMISTRY (LAB)			
ALKALINITY	MG/L	.200	30-500(A4)
CALCIUM	MG/L	.100	100. (F2)
CYANIDE	MG/L	.001	.20(A1)
CHLORIDE	MG/L	.200	250. (A3)
COLOUR	TCU	.5	5.0 (A3)
CONDUCTIVITY	UMHO/CM	1.	400. (F2)
FLUORIDE	MG/L	.01	2.4 (A1)
HARDNESS	MG/L	.50	80-100(A4)
MAGNESIUM	MG/L	.05	30. (F2)
SODIUM	MG/L	.20	200. (C3)
AMMONIUM TOTAL	MG/L	.002	.05(F2)
NITRITE	MG/L	.001	1.0 (A1)
TOTAL NITRATES	MG/L	.02	10. (A1)
NITROGEN TOTAL KJELDAHL	MG/L	.02	N/A
PH	DIMSNLESS	N/A	6.5-8.5(A4)
PHOSPHORUS FIL REACT	MG/L	.0005	N/A
PHOSPHORUS TOTAL	MG/L	.002	.40(F2)
TOTAL SOLIDS	MG/L	1.	500. (A3)
TURBIDITY	FTU	.02	1.0 (A1)
METALS			
ALUMINUM	UG/L	.050	100. (A4)

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
BERYLLIUM	UG/L	.010	0.20 (H)
CADMIUM	UG/L	.050	5.0 (A1)
COBALT	UG/L	.020	1000. (H)
CHROMIUM	UG/L	.100	50. (A1)
COPPER	UG/L	.100	1000. (A3)
IRON	UG/L	4.0	300. (A3)
MERCURY	UG/L	.01	1.0 (A1)
MANGANESE	UG/L	.050	50. (A3)
MOLYBDENUM	UG/L	.020	500. (H)
NICKEL	UG/L	.100	50. (F3)
LEAD	UG/L	.050	50. (A1)
SELENIUM	UG/L	.200	10. (A1)
SILVER	UG/L	.020	50. (A1)
STRONTIUM	UG/L	.050	2000. (H)
THALLIUM	UG/L	.010	13. (D4)
TITANIUM	UG/L	.050	N/A
URANIUM	UG/L	.020	20. (A2)
VANADIUM	UG/L	.050	100. (H)
ZINC	UG/L	.020	500. (A3)
PHENOLICS			
PHENOLICS (UNFILTERED REACTIVE)	UG/L	.2	2.0 (A3)
PESTICIDES & PCB			
ALDRIN	NG/L	1.0	700. (A1)
AMETRINE	NG/L	50.	300000. (D3)
ATRAZINE	NG/L	50.	60000. (B3)
ALPHA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	700. (G)
BETA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	300. (G)
GAMMA HEXACHLOROCYCLOHEXANE(LINDANE)	NG/L	1.0	4000. (A1)
ALPHA CHLORDANE	NG/L	2.0	7000. (A1)
GAMMA CHLORDANE	NG/L	2.0	7000. (A1)
BLADEX	NG/L	100.	10000. (B3)
DIELDRIN	NG/L	2.0	700. (A1)
METHOXYCHLOR	NG/L	5.0	100000. (A1)
ENDOSULFAN 1 (THIODAN I)	NG/L	2.0	74000. (D4)
ENDOSULFAN 2 (THIODAN II)	NG/L	4.0	74000. (D4)
ENDRIN	NG/L	4.0	200. (A1)
ENDOSULFAN SULPHATE(THIODAN SULPHATE)	NG/L	4.0	N/A
HEPTACHLOR EPOXIDE	NG/L	1.0	3000. (A1)
HEPTACHLOR	NG/L	1.0	3000. (A1)
METOLACHLOR	NG/L	500.	50000. (B3)
MIREX	NG/L	5.0	N/A
OXYCHLORDANE	NG/L	2.0	N/A
O,P-DDT	NG/L	5.0	30000. (A1)
PCB	NG/L	20.0	3000. (A2)
O,P-DDD	NG/L	5.0	N/A
PPDDE	NG/L	1.0	30000. (A1)
PPDDT	NG/L	5.0	30000. (A1)
ATRATONE	NG/L	50.	N/A
ALACHLOR	NG/L	500.	35000. (D2)
PROMETONE	NG/L	50.	52500. (D3)
PROPAZINE	NG/L	50.	16000. (D2)
PROMETRYNE	NG/L	50.	1000. (B3)
SENCOR (METRIBUZIN)	NG/L	100.	80000. (B2)
SIMAZINE	NG/L	50.	10000. (B3)
POLYAROMATIC HYDROCARBONS			
PHENANTHRENE	NG/L	10.0	N/A
ANTHRACENE	NG/L	1.0	N/A
FLUORANTHENE	NG/L	20.0	42000. (D4)
PYRENE	NG/L	20.0	N/A
BENZO(A)ANTHRACENE	NG/L	20.0	N/A
CHRYSENE	NG/L	50.0	N/A
DIMETHYL BENZO(A)ANTHRACENE	NG/L	5.0	N/A
BENZO(E)PYRENE	NG/L	50.0	N/A
BENZO(B)FLUORANTHENE	NG/L	10.0	N/A
PERYLENE	NG/L	10.0	N/A
BENZO(K)FLUORANTHENE	NG/L	1.0	N/A
BENZO(A)PYRENE	NG/L	5.0	10. (B1)

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
DIBENZO(A,H)ANTHRACENE	NG/L	10.0	N/A
INDENO(1,2,3-C,D)PYRENE	NG/L	20.0	N/A
BENZO(B)CHRYSENE	NG/L	2.0	N/A
CORONENE	NG/L	10.0	N/A
SPECIFIC PESTICIDES			
TOXAPHENE	NG/L	N/A	5000. (A1)
2,4,5-TRICHLOROBUTYRIC ACID (2,4,5-T)	NG/L	50.	280000. (B1)
2,4-DICHLOROBUTYRIC ACID (2,4-D)	NG/L	100.	100000. (A1)
2,4-DICHLORORPHENOXYBUTYRIC ACID	NG/L	200.	18000. (B3)
2,4-D PROPIONIC ACID	NG/L	100.	N/A
DICAMBA	NG/L	100.	87000. (B3)
PICHLORAM	NG/L	100.	2450000. (D3)
SILVEX (2,4,5-TP)	NG/L	50.	10000. (A1)
DIAZINON	NG/L	20.	14000. (A1)
DICHLOROVOS	NG/L	20.	N/A
DURSBAN	NG/L	20.	N/A
ETHION	NG/L	20.	35000. (G)
GUTHION	NG/L	N/A	N/A
MALATHION	NG/L	20.	160000. (G)
MEVINPHOS	NG/L	20.	N/A
METHYL PARATHION	NG/L	50.	7000. (B3)
METHYLTRITHION	NG/L	20.	N/A
PARATHION	NG/L	20.	35000. (B1)
PHORATE (THIMET)	NG/L	20.	35. (D2)
RELDAN	NG/L	20.	N/A
RONNEL	NG/L	20.	N/A
AMINOCARB	NG/L	N/A	N/A
BENONYL	NG/L	N/A	N/A
BUX (METALKAMATE)	NG/L	2000.	N/A
CARBOFURAN	NG/L	2000.	18000. (D3)
CICP (CHLORPROPHAM)	NG/L	2000.	350000. (G)
DIALLATE	NG/L	2000.	30000. (H)
EPTAM	NG/L	2000.	N/A
IPC	NG/L	2000.	N/A
PROPOXUR (BAYGON)	NG/L	2000.	90000. (G)
SEVIN (CARBARYL)	NG/L	200.	70000. (A1)
SUTAN (BUTYLATE)	NG/L	2000.	245000. (D3)
VOLATILES			
BENZENE	UG/L	.050	5.0 (B1)
TOLUENE	UG/L	.050	24.0 (B4)
ETHYLBENZENE	UG/L	.050	2.4 (B4)
PARA-XYLENE	UG/L	.100	300. (B4)
META-XYLENE	UG/L	.100	300. (B4)
ORTHO-XYLENE	UG/L	.050	300. (B4)
1,1-DICHLOROETHYLENE	UG/L	.100	7.0 (D1)
ETHLYENE DIBROMIDE	UG/L	.05	50. (G)
METHYLENE CHLORIDE	UG/L	.500	1750. (D3)
TRANS-1,2-DICHLOROETHYLENE	UG/L	.100	350. (D3)
1,1-DICHLOROETHANE	UG/L	.100	N/A
CHLOROFORM	UG/L	.100	350. (A1+)
1,1,1-TRICHLOROETHANE	UG/L	.020	200. (D1)
1,2-DICHLOROETHANE	UG/L	.050	5.0 (D1)
CARBON TETRACHLORIDE	UG/L	.200	5.0 (D1)
1,2-DICHLOROPROPANE	UG/L	.050	10.0 (G)
TRICHLOROETHYLENE	UG/L	.100	5.0 (D1)
DICHLOROBROMOMETHANE	UG/L	.050	350. (A1+)
1,1,2-TRICHLOROETHANE	UG/L	.050	.60(D4)
CHLORODIBROMOMETHANE	UG/L	.100	350. (A1+)
TETRACHLOROETHYLENE	UG/L	.050	10.0 (C2)
BROMOFORM	UG/L	.200	350. (A1+)
1,1,2,2-TETRACHLOROETHANE	UG/L	.050	0.17(D4)
CHLOROBENZENE	UG/L	.100	1510. (D3)
1,4-DICHLOROBENZENE	UG/L	.100	5.0 (B1)
1,3-DICHLOROBENZENE	UG/L	.100	130. (G)
1,2-DICHLOROBENZENE	UG/L	.050	200. (B1)
TRIFLUOROCHLOROTOLUENE	UG/L	.100	N/A
TOTAL TRIHALOMETHANES	UG/L	.500	350. (A1)
STYRENE	UG/L	.05	46.5 (D2)

Appendix A

DRINKING WATER SURVEILLANCE PROGRAM

The Drinking Water Surveillance Program (DWSP) for Ontario monitors drinking water quality at municipal water supply systems. The DWSP Database Management System provides a computerized drinking water quality information system for the supplies monitored. The objectives of the program are to provide:

- immediate, reliable, current information on drinking water quality,
- a flagging mechanism for 'Objective' exceedence,
- a definition of contaminant levels and trends,
- a comprehensive background for remedial action,
- a framework for assessment of new contaminants,
- and an indication of treatment efficiency of plant processes.

Program

The DWSP officially began in April 1986 and is designed to eventually include all municipal water supplies in Ontario; currently 44 plants are being monitored. Water supply locations have been prioritized for surveillance, based primarily on criteria such as population density, probability of contamination and geographical location.

An ongoing assessment of future monitoring requirements at each location will be made. Monitoring will continue at the initial locations at an appropriate level and further locations will be phased into the program as resources permit. It is estimated that after 4 years of operation, the program will be monitoring 90 locations.

A major goal of the program is to collect valid water quality data, in context with plant operational characteristics at the time of sampling. As soon as sufficient data have been accumulated and analysed, both the frequency of sampling and the range of parameters may be adjusted accordingly.

Assessments are carried out at all locations prior to initial sampling in order to acquire complete plant process and distribution system details, and to designate (and retrofit if necessary) all sampling systems and locations. This ensures that the sampled water is a reflection of the water itself.

Samples are taken of the raw (ambient water) and the treated water at the treatment plant, and of consumer's tap water in the distribution system. In order to determine possible effects of distribution on water quality, both standing and free flow water in old and new sections of the distribution system are sampled.

Sampling is carried out by operational personnel who have been trained in the applicable procedures.

Comprehensive standardized procedures and Field Test kits are supplied to sampling personnel. This ensures that samples are taken and handled according to standard protocols and that field testing will supply reliable data. All field and laboratory analyses are carried out using "approved documented procedures". All laboratory analyses are carried out by the MOE Laboratory Services Branch.

Data Reporting Mechanism

When the analytical results are transferred from the MOE laboratory into the DWSP system, printouts of the completed analyses are sent to the MOE District Officer, the appropriate operational staff and are also retained by the DWSP co-ordinator.

DWSP INPUTS AND OUTPUTS

The DWSP INPUTS and OUTPUTS are illustrated in Fig. 1.

PROGRAM INPUTS

PLANT AND DISTRIBUTION SYSTEM DESCRIPTION

The system description includes plant specific non-analytical information acquired through a questionnaire and initial plant

visit. During the initial assessment of the plant and distribution system the questionnaire content is verified and missing information added. It is intended that all data be kept current with scheduled annual updates.

The PLANT and DISTRIBUTION SYSTEM DESCRIPTION consists of the following seven components.

1. Process component inventory

All physical and chemical processes that the water is subjected to, from the intake pipe to the consumers' tap (where possible), are documented. These include: process type, general description of physical structures, material types, sizes, and retention time for each process within the plant. The processes may be as simple as transmission or as complex as carbon adsorption.

2.Treatment chemicals

Chemicals used in the treatment processes, their function, application point, supplier and brand-name are recorded. The chemical dosages applied on the day of sampling are recorded in DWSP.

3. Process control measurements

Documentation of in-plant monitoring of process parameters (turbidity, chlorine residuals, pH, aluminum residuals) including methods used, monitoring locations and frequency is contained in

this section. In-plant monitoring results are generally not retained in DWSP but are retained by the Water Treatment Plant.

4. Design flow and retention time

The hydraulic capacity, designed and actual, is noted here. Retention time (the time that a block of water is retained in the plant) is also noted. The maximum, minimum and average flow as well as a record of the flow rate on the day of sampling are recorded in DWSP.

5. Distribution system description

This area includes the storage and transmission characteristics of the distribution system after the water leaves the plant.

6. Sampling system

Each plant is assessed for its adequacy in terms of sampling of bacteriological, organic and inorganic parameters. The prime considerations in the assessment and design of the sampling system are:

i/ the sample is an accurate representation of the actual water condition, eg. raw water has had no chemical treatment;

ii/ the water being sampled is not being modified by the sampling system;

iii/ the sample tap must be in a clean area of the plant,

preferably a lab area;

iv/ the sample lines must be organically inert (no plastic, ideally stainless steel).

It is imperative that the sampled water be a reflection not of the sampling system but of the water itself.

The sampling system documentation includes: origin of the water; date sampling was initiated; size, length and material type (intake, discharge and tap), pump characteristics (model, type, capacity) and flow rate.

7. People

This section contains the names, addresses and phone numbers of current plant management and operational staff, distribution system management and operational staff, Medical Officer of Health and appropriate Ministry of Environment personnel associated with the plant.

FIELD DATA

The second major input to DWSP is field data.

Field data is collected at the plant and from the distribution system sites on the day of sampling. The field data consists of general operating conditions and the results of testing for field parameters. General operating conditions include chemicals used,

dosages, flow and retention time on the day of sampling as well as monthly maximum, minimum and average flows. Field parameters include turbidity, chlorine residuals (free,combined and total), temperature and pH. These parameters are analysed according to standardized DWSP protocols to allow for interplant comparison.

LABORATORY ANALYTICAL DATA

The third major input to DWSP is Laboratory Analytical Data.

Samples gathered from the raw, treated and distribution sampling sites are analyzed for approximately 160 parameters at a frequency of two to twelve times per year. Sixty-five percent of the parameters are organic. The parameters measured may have health or aesthetic implications when present in drinking water. Many of the parameters may be used in the treatment process or may be treatment by-products. Due to the nature of certain analytical instruments parameters may be measured for in a "scan" producing some results for parameters that are not on the DWSP priority list but which may be of interest. The majority of the parameters are measured on a routine basis however, those that are technically more difficult and/or costly to analyse for are done less frequently. These include Specific Pesticides and Chlorophenols.

Although the parameter list is extensive, additional parameters with the potential to cause health or aesthetic related problems

may be added provided reliable analytical and sampling methods exist.

All laboratory generated data is derived from standardized, documented analytical protocols. The analytical method is an integral part of the data and as methods change notation will e be made and intercomparison data documented.

PARAMETER REFERENCE INFORMATION

The fourth major input to DWSP is Parameter Reference Information

This is a catalogue of information for each substance analysed on DWSP. It includes parameter name and aliases, physical and chemical properties, basic toxicology, world-wide health limits, treatment methods and uses. The Parameter Reference Information is computerized and can be accessed through the Query function of the DWSP database.

An example is shown in fig. 2.

A written copy (hard version) of the Parameter Reference Information will be available in the near future and is a new and sophisticated enhancement to the DWSP.

PROGRAM OUTPUTS

There are four major program outputs, Query, Action Alert, Report Generation and the Annual Report.

QUERY

All DWSP information is easily accessed through the Query function, therefore anything from addresses of plant personnel to complete water quality information for a plant's water supply is instantly available. The DWSP computer system makes relatively complex inquiries manageable. A personal password allowing access into the DWSP query mode in all MOE offices is being developed by the DWSP group.

ACTION ALERTS

Drinking Water quality in Ontario is evaluated against provincial objectives as outlined in the publication, Ontario Drinking Water Objectives (ISBN 0-7729-2725-1 revised 1983). This publication contains health-related Maximum Acceptable Concentrations for thirty substances. Should the reported level of a substance in treated water exceed the Ontario Drinking Water Objective an "Action Alert" requiring resampling and confirmation is issued. This assures that operational staff, health authorities and the public are notified as soon as possible of confirmation of an exceedance and remedial action taken. This report supplies a history of the occurrence of past exceedences at the plant plus a historical summary on the parameter of concern.

In the absence of Ontario Drinking Water Objectives, other agency guidelines which are documented in the Parameter Reference Information may be used. If these guidelines are exceeded the results are flagged and evaluated by DWSP personnel. An "Action Alert" will be issued if warranted.

REPORT GENERATION

Custom reports can be generated from DWSP to meet the needs of the regions and to respond to public requests.

ANNUAL REPORTS

It is the practice of DWSP to produce an annual report containing analytical data along with companion plant information.

FIG. 1

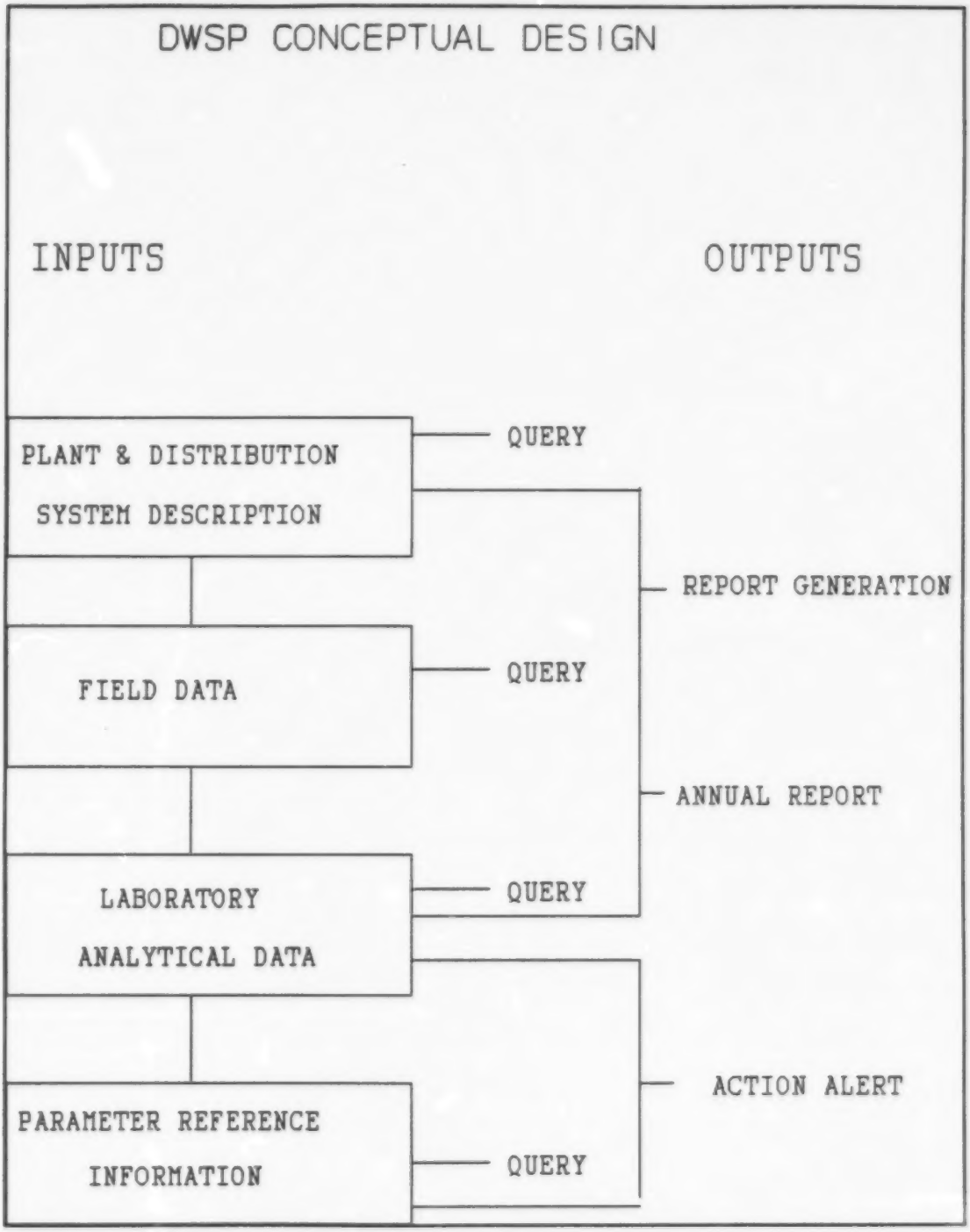
DWSP CONCEPTUAL DESIGN
INPUTS
OUTPUTS
PLANT & DISTRIBUTION SYSTEM DESCRIPTION
FIELD DATA
LABORATORY ANALYTICAL DATA
PARAMETER REFERENCE INFORMATION
QUERY
QUERY
QUERY
QUERY
REPORT GENERATION
ANNUAL REPORT
ACTION ALERT

FIG.2

MOE - DRINKING WATER ASSESSMENT PROGRAM (DWSP)

(B2001P) PARAMETER REFERENCE
BENZENE

SOURCE	FROM	TO	METHOD	TARG	UNIT	NOTE
EPA	C 86/04		NOMETH	.00	063000 UG/L	RMCL
EPAA	C 80/11		NOMETH	6.60	063000 UG/L	
FERC	C 84/05		NOMETH	1.00	063000 UG/L	
WHO	C 84/01		NOMETH	10.00	064000 UG/L	

DESCRIPTION: NAME: BENZENE
CAS#: 71432
MOLECULAR FORMULAE: C_6H_6
DETECTION LIMIT: (FOR METHOD POCODO) 0.05 UG/L
SYNONYMS: BENZOLE, COAL NAPHTHA, CARBON OIL (27), CYCLOHEXATRIENE (41)
CHARACTERISTICS: COLOURLESS TO LIGHT YELLOW, MOBILE, NON-POLAR LIQUID, OF HIGHLY REFRACTIVE NATURE, AROMATIC, VAPOURS BURN WITH SMOKING FLAME (30)
PROPERTIES:
SOLUBILITY IN WATER: 1780-1800 MG/L AT 25 DEG C (41)
THRESHOLD ODOUR: NO DATA
THRESHOLD TASTE: 0.5 MG/L IN WATER (39)
ENVIRONMENTAL FATE: MAY BIOACCUMUALTE IN LIVING ORGANISMS, APPEARS TO BIOACCUMULATE IN ANIMAL TISSUES THAT EXHIBIT HIGH LIPID CONTENT OR ARE MAJOR METABOLIC SITES (LIVER, BRAIN), SMALL QUANITIES EVAPORATE FROM SOIL OR DEGRADE QUICKLY
SOURCES: PETROLEUM REFINING, SOLVENT RECOVERY, COAL TAR DISTILLATION, FOOD PROCESSING, TANNING.
USES: PREPERATION OF ETHYL BENZENE USED AS A STYRENE MONOMER, DETERGENTS, NYLON, AS INTERMEDIATE IN PESTICIDE PRODUCTION, SOLVENT IN RUBBER INDUSTRY, DEGREASING AND CLEANSING AGENT, GASOLINE.
TOXICITY: RATING 4 (VERY TOXIC); ACUTE - IRRITATES MUCOUS MEMBRANES, SYMPTONS INCLUDE RESTLESSNESS, CONVULSIONS, DEPRESSION, RESPIRATORY FAILURE; CHRONIC - ANEMIA AND LEUKEMIA (45).
CARINOGENICITY: HUMAN CARCINOGEN AND MUTAGEN
REMOVAL: GAC ADSORPTION, PRECIPITATION WITH ALUM FOLLOWED BY SEDIMENTATION, COAGULATION AND FLOCCULATION, SOLVENT EXTRACTION, OXIDATION (41).
MOLECULAR WEIGHT: 78.12 GRAMS
MELTING POINT: 5.5 DEGREES C (27)
BOILING POINT: 80.1 DEGREES C (27)
SPECIFIC GRAVITY: 0.879 AT 20 DEGREES C (27)
VAPOUR PRESSURE: 100 MM AT 26.1 DEGREES C
HENRY'S LAW CONSTANT: 0.00555 ATM M_3/MOLE
LOG OCT./WATER PAR.COEFF: K=1.0 1/N=1.6 R=.97 PH=5.3

Appendix B

DWSP SAMPLING GUIDELINE

i) RAW and TREATED at PLANT

General Chemistry	-500 mL clear plastic bottle -rinse bottle with sample three times and discard water -fill to line
Bacti	-250 mL clear glass bottle with white seal on cap -do <u>not</u> rinse bottle; preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL clear plastic bottle with white lid -rinse bottle and cap three times, discard -fill to line -add 10 drops nitric acid (**Caution:** HNO_3 is corrosive)
Volatiles (OPOPUP)	-250 mL clear glass bottle -do <u>not</u> rinse bottle -tilt bottle when filling -fill bottle completely; there should be no air bubbles.
Organic (OWOC),(OWTRI),(OAPAHX)	-1 liter brown glass bottle per scan -do <u>not</u> rinse bottle -fill to approx. 1" from top -when 'special pesticides' are requested three extra bottles per sample must be submitted
Cyanide	-500 mL clear plastic bottle -do <u>not</u> rinse bottle -fill to approx. 1" from top -add 10 drops sodium hydroxide (**Caution:** NaOH is corrosive)

Mercury	-250 mL clear glass bottle -rinse bottle and cap three times, discard then fill to top of label -add 20 drops each nitric acid and potassium dichromate (**Caution:** HNO_3 and $KCrO_7$ corrosive)
Phenols	-250 mL clear glass bottle -do <u>not</u> rinse bottle -fill to top of label as marked

<u>Steps</u>

1. Let cold water tap run for several minutes.
2. Record time in submission sheet.
3. Record teperature on submission sheet.
4. Fill up all bottles as per instructions.
5. Record chlorine residuals (free, combined and total for treated water only), turbidity and pH on submission sheet.

ii) Distribution Samples (standing water)

General Chemistry	-500 mL clear palstic bottle -rinse bottle with sample three times and discard -fill to line
Metals	-500 mL clear plastic bottle with white lid -rinse bottle and cap three times, discard -fill to line -add 10 drops nitric acid (**Caution:** HNO_3 is corrosive)

Steps:

1. Record time on submission sheet.
2. Place bucket under tap and open cold water.
3. Fill to predetermined volume.
4. After mixing the water, record the temperature on the submission sheet.
5. Fill general chemistry and metals bottles.
6. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.

iii) Distribution Samples (free flow)

General Chemistry	-500 mL clear plastic bottle -rinse bottle with sample three times and discard water -fill to line
Bacti	-250 mL clear glass bottle with white seal on cap -do <u>not</u> rinse bottle; preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL clear plastic bottle with white lid -rinse bottle and cap three times, discard -fill to line -add 10 drops nitric acid (**Caution:** HNO_3 is corrosive)
Volatiles (OPOPUP)	-250 mL clear glass bottle -do <u>not</u> rinse bottle; preservative has been added -tilt bottle when filling -fill bottle completely; there should be no air bubbles
Organic (OWOC),(OWTRI)	-1 liter brown glass bottle per scan -do <u>not</u> rinse bottle: preservative has been added -fill to approx. 1" from top
Cyanide	-500 mL clear plastic bottle -do <u>not</u> rinse bottle: preservative has been added -fill to approx. 1" from top -add 10 drops sodium hydroxide (**Caution:** NaOH is corrosive)
Mercury	-250 mL clear glass bottle -rinse bottle and cap three times, discard then fill to top of label -add 20 drops each nitric acid and potassium dichromate (**Caution:** HNO_3 and KCrO7 corrosive)

Steps:

1. Record time on submission sheet.
2. Let cold water flow for ten minutes.
3. Record temperature on submission sheet.
4. Fill all bottles as per instructions.
5. Record chlorine residuals (free, combined and total), tubidity and pH on submission sheet.